Monitoring report form

(Version 04.0)

MONITORING REPORT	
Title of the project activity	Aqua Clara Water Filtration Program in Kenya
Reference number of the project activity	GS 1078
Version number of the monitoring report	Version 065
Completion date of the monitoring report	0827/01/2015
Registration date of the project activity	26/12/2013
Monitoring period number and duration of this monitoring period	Monitoring Period 1 Duration: 28/12/2011 – 21/07/2014[1]
Project participant(s)	Aqua Clara Foundation
Host Party(ies)	Kenya
Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)	Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption"
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	The estimated amount of GHG is 66054 tCO2e. This amount is estimated in accordance to the registered PDD.
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	**31,500** ~~34,145~~ tCO2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	9,440 ~~10,380~~ tCO2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	22,060 ~~23,765~~ tCO2e

[1] The above period is determined two years prior to the registration of this retroactive project activity in accordance to the rules for retroactive crediting. http://www.goldstandard.org/wp-content/uploads/2012/05/v2.2_ANNEX-P.pdf

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>The Aqua Clara Water Filtration Program in Kenya hereinafter called the 'project activity', seeks to introduce the Aqua Clara Foundation's flagship products to the market in Kenya; the ACF Bio Sand Filter (BSF) and the Sand and Membrane (SAM) large-scale filter. These ACF water purifiers (hereinafter described as the project technology) displace the use of firewood fuel traditionally used to boil water for domestic consumption and in the alternative offer an affordable, long-term solution for households that typically consume raw water from turbid sources. The project activity seeks to introduce approximately 23, 875 BSF purifiers , 4 SAM and 4,800 household SAM units with a production capacity of 150 – 300 litres of water per day throughout the 10 year crediting period in rural and peri-urban Kenya.

The project biosand filter can purify up to 36 liters per day. However, this capacity can be scaled up, with proper maintenance. Proper maintenance of the filters in this project activity is ensured through the CHP's monthly visit to the households. BioSand Filters are proved to give 12-18 litres of water in an hour[2]. With this efficiency of 36 to 40 liters per day, coupled with a 10 year lifespan, 8,000 litres per day for the SAM, both project technologies can provide enough water to meet and exceed the World Health Organization recommended domestic water consumption rate of 7.5 litres per capita per day[3].

The project technologies offer an affordable, clean, efficient and easy-to-use alternative for water purification within the rural area that the project activity seeks to operate in. In addition the project activity will actively reduce CO2 emissions and diminish the associated risks of Indoor Air pollution.

To date the PP has installed a total of 3122 Bio Sand filters used for domestic use in two counties in the project boundary. Only one large scale SAM filter has been installed in the project boundary but it is not consistently operational and therefore was not monitored during this period to ensure conservativeness.

(a)Relevant Dates of Project Activity

- Start date of project activity i.e., it is the date on which distribution of water filter under the proposed project activity began. – 26th June 2009
- Annual Filter sales since start date of the project:
  July 2009 to June 2010: 400 filters
  July 2010 to June 2011: 617 filters
  July 2011 to June 2012: 1010 filters
  July 2012 to June 2013: 791 filters
  July 2013 to May 2014: 304 filters

- Project registration date was 26th December 2013.
- Start Date of Monitoring Survey 22nd July 2014

(b) Total GHG emission Reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period

The total GHG emission reductions achieved in this monitoring period (between 28th December 2011 and 21/07/2014) is ~~31,500~~ 31,500 tCO2~~34,145tCO2e~~.

A.2. Location of project activity

>>The project activity targets to operate within 23 counties within the terrestrial limits of the Republic of Kenya. However, project technologies included in this monitoring exercise are implemented in Kisii, Uasin Gishuand counties of the Republic of Kenya.

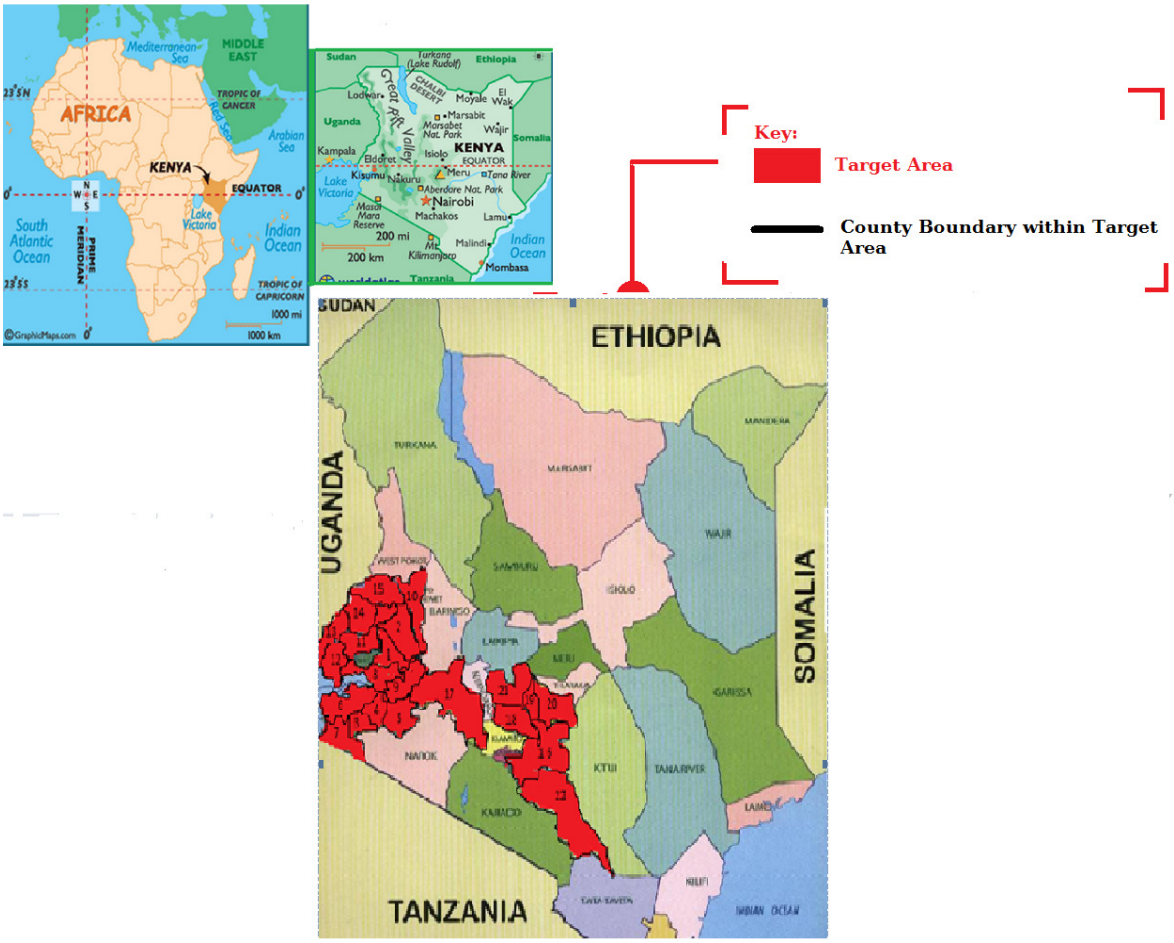
Host Parties:

[2] http://www.cawst.org/resources/biosand-filter

[3] http://www.who.int/water_sanitation_health/diseases/WSH03.02.pdf

Kenya

Region/State/Province:
The project will operate across the 23 counties listed below:



County	Coordinates	County	Coordinates	County	Coordinates	County	Coordinates
Nandi,	00.1666670, 035.1500000	Bomet	-00.8000000, 035.2333000	Kericho,	35.3000000, -000.3666667	Busia,	34.1500000, 000.4333333
Uasin Gishu,	00.5166670, 035.2833000	Homa Bay,	-00.6833330, 034.4500000	Elgeyo,	35.5086111, 000.9483333	Bungoma,	34.5833333, 000.5833333
Kisii,	-00.6666670, 034.7500000	Migori,	34.8333333, -000.6666667	Kakamega,	34.7500000, 000.2833333	Trans Nzoia,	34.5833333000.5833333
Nyamira,	-00.7500000, 035.0000000	Kisumu,	34.9167000, -000.2500000	Siaya,	34.7500000, 000.2833333	Machakos,	7.2500000, 001.5000000
Nakuru,	-00.5000000, 036.0000000	Kirinyaga,	37.2833333, -000.500000	Nyeri,	36.9500000, -000.4166667	Nairobi	36.8166667, 001.2833333
Muranga,	-00.7500000, 037.1166667	Embu,	: 37.4500000,-000.533333	Makueni.	37.6166667, -001.8000000		

City/Town/Community:
The project will operate in various towns and villages in the following 23 counties: Nandi, Uasin Gishu,Kisii, Nyamira, Nakuru, Muranga, BometHoma Bay, Migori, Kisumu, Kirinyaga, Embu, Kericho, Elgeyo, Kakamega, Siaya, Nyeri, Makueni.Busia, Bungoma, Trans Nzoia, Machakos, Nairobi

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of Kenya (host)	Aqua Clara Foundation	No

A.4. Reference of applied methodology and standardized baseline

>>The project is eligible under the GS methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption[4]

Other Gold Standard tools and annexes included in the project development include:

1. Gold Standard Tool Kit Version 2.2 [5]
2. Guidelines for carrying out usage surveys for projects implementing household water filtration technologies[6]

A.5. Crediting period of project activity

>>The fixed 10 year crediting period started on 28/12/2011. This is a singular monitoring exercise and is only employed in light of delayed registration. Thereafter all monitoring surveys shall be conducted annually as stated earlier in the PDD. Owing to the registration of the project activity occurring on 26th December 2013, credits are claimed up to two years prior to this date (28th December 2011), in accordance to the Gold standard rules on retroactive crediting[7].

A.6. Contact information of responsible persons/ entities

>>Viability Africa, LLC is responsible for completing this CDM-MR-FORM and is not a project participant.
Carbon Asset Consultant:

Name: Natasha Georgete
Organization: Viability Africa, LLC
Contacts: natasha.georgete@viabilityafrica.com

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>>The Aqua Clara Water Filtration Program in Kenya, aims to distribute three project technologies in the described project boundary in section A.2 of this monitoring report. The flagship product, the bio-sand filter is a plastic gravitation based slow sand filtration technology which is applicable for point of use water treatment in households and can treat up to 36 liters of water per day.. The Sand and Membrane filters (both household and community) operate by combining slow sand filtration and reverse osmosis to achieve low cost high quality water treatment solutions.

The project proponent started commercial distribution of the project technologies in 2009 which marked the project start date. The company has since then built its distribution network in a system that involves the use of Community Development Officers (CDOs) and Community Health Promoters (CHPs) who work within the various communities under which Aqua Clara serves. These micro-entrepreneurs distribute and market filters after receiving training from the project proponent. This distribution model has proved to be pivotal to Aqua Clara's success because the 74 CDP and CHPs have ready access to these households which allows for constant feedback and follow up on customers after initial installations.

---

[4] CDM Gold Standard:

http://www.cdmgoldstandard.org/wp-content/uploads/2011/10/GS_110411_TPDDTEC_Methodology.pdf

[5] http://www.cdmgoldstandard.org/wp-content/uploads/2012/06/GSv2.2_Toolkit.pdf

[6] http://www.goldstandard.org/wp-content/uploads/2011/09/Rule-Update-Guidelines-for-carrying-out-water-usage-surveys.pdf

[7] http://www.goldstandard.org/wp-content/uploads/2012/05/v2.2_ANNEX-P.pdf

- The project Proponent, Aqua Clara Foundation contracted Viability Africa as the carbon asset consultant for the project activity. Since the start of the carbon asset development process, the following has been achieved: The Local Stakeholder Consultation (LSC) was hosted on May 7th 2011. An LSC report with signed participants' lists has been uploaded verifying this date. The LSC report was submitted on 20th September 2011. LSC Report listed on GS Registry – 2nd January 2012. The LSC report is already uploaded on Markit with its timestamp recorded
- Voluntary Emissions Reductions Purchase Agreement Executed on 13th December 2011
  The VERPA has been uploaded to the registry and submitted to the DOE however the PP requests that same are not made publicly available.
- Contract to commence Validation was executed February 29th 2012
  The PP has uploaded the executed contract between the DOE and the PP on the project registry and submitted the same to the DOE.
- GS Passport submitted to Gold Standard Foundation (uploaded on GS Registry). – 19th March 2012
- Validation work plan uploaded on GS registry. – 27th August 2013
- Request for Registration submitted to Gold Standard Foundation – 11th November 2013
- The project was registered on 26th December 2013.

To date, the a total of 3122 Bio Sand filters has been installed for domestic use, one large Sand and Membrane (SAM) filter and anticipates rolling out the distribution of the household SAM filters by the end of the year 2014. At the time of installations of bio sand filters and household community SAM filters households are issued with receipts and each filter is assigned a unique identification number to avoid double counting. The Project Proponent then keeps record of all sales which are then accumulated as the Total Sales Record. For community SAM units, data entry is one at the point of the first purchase of water from the community SAM unit which then compiled into a Total Sales record which is kept by the project Proponent. Community Large Scale filters shall be however not be monitored in this monitoring exercise.
Given this project activity is a retroactive project activity; the Project Proponent used administrative official's namely local chiefs to sign the VER transfer sheets on the behalf of the end users. End users were then called and informed of the carbon claim by the Aqua Clara Foundation and that the chiefs would be signing on their behalf. For all the project technologies implemented after this monitoring exercise, a sticker shall be attached to each of the BSF filters explaining VER transfer in English and Kiswahili.

The Project Technology

1. The Biosand Filter

Several point-of-use water purification technologies are available in Kenya including boiling, chlorination, solar disinfection (using sunlight), flocculent-disinfectants and chlorination. An emerging purification method can be found in the Bio-sand filters (BSF) which are an improvement on the traditional slow sand filters. The average efficiency of a BSF is 95-99% elimination of microbial contaminants[8]. However, this figure varies based on the design and operating properties.

The Aqua Clara Foundation Purifier has incorporated a granulated brass disinfectant into one of the filter layers which not only improves the filter performance but also adds a residual cleaning effect.

Maintenance of the ACF BSF is relatively simple as it only requires that the consumer to clean the filter once or twice a year depending on the turbidity of the water. Highly turbid sources of water tend to clog the filter hence reducing the flow rate. However the user can increase the flow rate by simply adding 10 litres of water to the BSF unit, swirling the top 4-6 cm of sand up into the water with a stick, taking all sediments into suspension, pausing to allow sand grains to settle out and then scooping and dumping the water out. This simple procedure will guarantee the consumer continued filtration throughout the lifespan of the BSF unit of 10 years. The first maintenance check is done by the installer of the BSF unit, who has received training from ACF, followed by a demonstration of the maintenance.

[8] Bio-filtration as an Air Pollution Control Technology for the Removal of Volatile Organic Compounds: http://www.scribd.com/doc/49833275/Biofiltration-as-an-Air-Pollution-Control-Technology-for-the-Removal-of

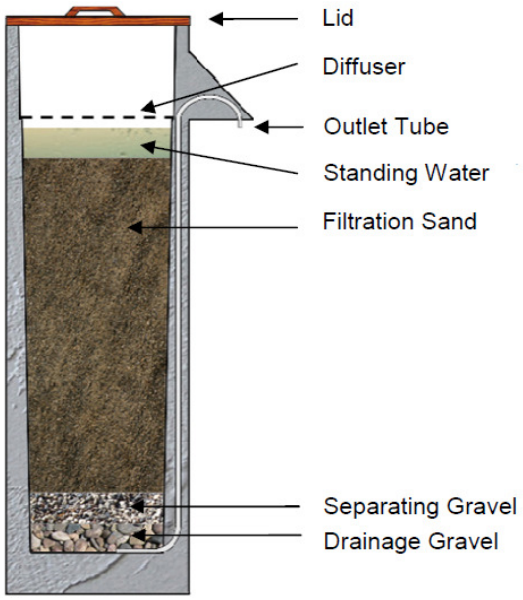


Figure 1: Simple Cross-Section of Bio Sand Filter

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

>>PP has revised the monitoring frequency for SD indicators from annually to biennially for the retroactive crediting period. The same was done after PP received a clarification from the Gold Standard Foundation on the same issue. Subsequent monitoring of the same parameters in monitoring periods to come will adhere to the registered PDD monitoring plan of annual basis monitoring.

B.2.2. Corrections

>>N/A

B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>>N/A

B.2.4. Changes to project design of registered project activity

>>N/A

B.2.5. Changes to start date of crediting period

>>N/A

B.2.6. Types of changes specific to afforestation or reforestation project activity

>> N/A

SECTION C. Description of monitoring system

>>

1. Monitoring Procedure

A total sales record and a project database was maintained continuously and stored on an electronic database maintained by both Viability Africa and Aqua Clara Foundation.

Total Sales Record

An accurate and complete sales record has been maintained by the project proponent and backed up electronically by the Viability Africa LLC, the carbon asset development consultant. As illustrated in the Total Sales record used in this monitoring exercise, which is attached as appendix to this monitoring report, it is developed in accordance with the selected baseline and monitoring methodology which is required the following data:

1) Date of sale
2) Geographic area of sale
3) Model/type of project technology sold
4) Quantity of project technologies sold
5) Name and telephone number and address:
6) Mode of use: domestic, commercial or other:
7) Unique Filter serial number

Project Database

This has been developed from the total sales record.

2. On-going Monitoring Studies

The monitoring exercise was a combination of the usage survey, monitoring survey and the Water Consumption Tests.

a) **Monitoring Survey**- Completed annually, beginning 1 year after project registration. The project participant has conducted the annual monitoring surveys which were used to investigate annual changes in the project scenario. Since the project activity is retroactive, the monitoring surveys investigate annual changes in the project scenario for the last two years since the registration of the project activity which are identified as December 2011 to December 2012, and December 2012 to December 2013.

b) **Usage Survey**- Completed annually, or more frequently, and in all cases on time for any request of issuance. The usage survey in this monitoring exercise provides a single usage parameter that is weighted based on drop off rates that are representative of the age distribution for project technologies in the total sales record. The usage parameter in the usage survey shall be based on users who completely abandon use of the ACF filter and those that do not properly use or maintain the filter so as to affect the quality of water treated. This survey was carried out using closed questionnaires and spot checks. The usage survey was carried out from 22nd July 2014 and went on for about a 2 week period.

c) Project Field Test Update- Completed annually, this is an extension of the project PFT and provides a water consumption assessment representative of project technologies currently every year. Hence the PFT update accounts for changes in the project scenario over time as project technologies age and new customers are added, also as new models and designs are introduced.

Water Consumption Field Test Protocol (WCFT):

The PP employed the following WCFT protocol. The protocol employed field exercises based on the Kitchen Project Test (KPT) guidelines in Annex 4 of the approved methodology. The protocol was executed over a four day period with the first day targeted at questionnaires and surveys with the remaining three left dedicated to WCFT exercises. The entire process was an 18 day exercise that began on the 23rd of July to 15th August 2014.

The four day WCFT per household was not carried out over a holiday period to ensure conservative quantification of water consumption per household. As such the PP skipped the 28th of July as it was the national holiday, *Eid al-Fitr* (end of *Ramadan*) in Kenya.

Day 0: Training of field enumerators

The PP carried out training exercise with the enumerators who would then proceed to carry out the WCFT. The PP went over the survey questions to be asked during WCFT exercise as well as did mock examples of real WCFT with the enumerators to ensure they understood what would take place in a real world situation in

the field. Calibrated buckets were issued to each of the enumerators which they would use in the field in measuring the water volume consumed in a day per household. Enumerators were expressly told to ensure maximum accuracy in measuring water using the buckets.

The PP explained the parameters Q,p,y, Q,p cleanboil, and Q,p,raw boil. The enumerators were to enquire of the households on the day of the surveys what the household water treatment method was – Boiling raw water, consuming raw water, filtering raw water only, or filtering raw water then boiling the clean water. This was to account for parameters Q,p,rawboil, Q,p,y, Q,p,cleanboil respectively. For households that boil raw water, the PP explained that the enumerator was to measure the water the household would consume that day before the water was put in the boiling pan and record that volume. For the households who consume raw water, no testing was to be done in such a household. For households who filter raw water only, the enumerator was instructed to measure the water that would be used in a day before this water was poured into the filter. For water that was filtered and thereafter boiled, the enumerator was instructed to measure the volume of filtered water before it was poured into the boiling pot. The PP also stressed to the enumerators that they were to ask the households the number of people living in the house on each of the 3 days the exercise would be conducted. The enumerators were provided with the list of households they would visit as well as the contact information of those households as provided in the Total Sales Records.

Day 1 - Surveys and Introduction

The PP executed Usage surveys, Sustainable Development (SD) assessments and other non-field exercise surveys for the same sampling units as the WCFT for the monitored project technology (Household BSF units). The PP then informed households of the three day WCFT exercise informing them that they were to treat water as they normally do year round.

Day 2 - 4. WCFT exercise

The WCFT took a 3 week period to complete in order to ensure weekends were avoided as well as a public holiday. The enumerators had varying schedules depending on the times agreed upon by the households and the water treatment culture of the same. Based on the schedule of respective households' water treatment enumerators conducted a volumetric assessment for raw water before it was added to the filter.. This assessment was conducted using standardized volumetric calibrated (in litres) buckets. Raw water carried by the households was measured in these flasks before being filtered through the BSF Filter.

The mean value of the total raw water (the total water filtered per day aggregated over a three day period) established the value Q,p,y per household. Which was then aggregated (after elimination of outliers) to determine the value used to calculate Emission Reductions for the whole project per technology.

The household was then asked if at all they boil any of the clean water or if they consume any raw water without boiling.

For clean water boiled (Q,p,clean,boil) the same volumetric assessment was conducted for the amount of water boiled with the enumerator quantifying how much clean water was boiled prior to the same being added to the boiling pot.

For raw water, (Qp, rawboil, y) the volumetric assessment was conducted prior to the water being added to the boiling pot.

The WCFT was recorded on a day to day basis - the number of people living in the household - daily questionnaire/ log entry. Each day, the household representative was asked what treatment option they use for treating their water and this was recorded in the form as well as electronically in the monitoring survey summary. The average number of persons per household was obtained for the 3 day period for each type of water treatment chosen as well as the average volume of water consumed[9].

The Water Consumption Field Test Procedures stated here above and further elaborated in the monitoring survey attached as appendices to this monitoring report is developed in accordance to the Guidelines KPT guidelines in Annex 4 of the approved methodology.

[9] Monitoring survey summary

In addition to these monitoring requirements, the PP also included questions in the monitoring survey to establish the Cj factor to be used for emissions reductions calculations for issuance. These questions examined baseline water treatment practices, determining any energy poverty barriers which prevented persons from water treatment prior to the project scenario as well as most likely water treatment options in the absence of the said energy poverty barriers.
The outcome of the WCFT have been summarised in the monitoring survey summary.

d) Water Quality Tests

The PP collected samples of water from the each household which had been selected as sampling units from the technology specific sampling frame. Each water sample was labelled to show which sample was from the filtered water and which was from the raw water and from which household the sample was collected. The samples were then stored in cool packs. At a central field laboratory all the samples were tested and results recorded for each individual sample. This ensured that the PP's water quality testing was representative and robust. Field laboratory testing was selected because it allows for near immediate testing without contamination or any other distortion from the transportation to laboratories. The drinking standard doesn't specifically approve or endorse either method of water testing but rather specifies quantified limits that determine the quality of the water. The use of field laboratory tests is approved in the methodology and is a commonly accepted international approach[10].

e) Leakage Assessment

As demonstrated in section B.6.3 of the PDD, there are no perceived leakage risks for this parameter.

f) Non Renewable Biomass Assessment Update

The NRB assessment update will not occur for the project given its fixed baseline and the fact that the project scale is not large enough to affect the national NRB fraction.

SECTION D. Data and parameters

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

Data/Parameter:	Wb,y
Unit:	Tonnes/litre
Description:	Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b
Source of data:	Baseline water Boiling test
Value(s) applied):	0.000417848
Purpose of data:	The value provided above was derived from water boiling tests as recommended by the methodology. The value selected is the mean value derived from 105 individual tests. The purpose of the data is calculation of Baseline Emissions
Additional comment:	N/A

Data / Parameter:	EFb,fuel,CO2
Unit:	tCO2/TJ
Description:	CO2 emission factor of the wood fuel
Source of data:	IPCC Default emission factor[11]
Value(s) applied):	112

[10] http://www.who.int/water_sanitation_health/resourcesquality/wqmchap6.pdf

[11] 2006 Guidelines, Vol. 2, Ch. 2, Table 2.5

Purpose of data:	Calculation of baseline and Project emissions
Additional comment:	N/A

Data / Parameter:	NCV_b
Unit:	TJ/ton
Description:	Net calorific value of wood fuel used in the baseline
Source of data:	IPCC default value
Value(s) applied):	0.015
Purpose of data:	Calculation of baseline and Project emissions
Additional comment:	N/A

Data / Parameter:	EFb,fuel,CH4
Unit:	tCH_4/TJ
Description:	CH_4 emission factor of the wood fuel
Source of data:	IPCC Default emission factor[12]
Value(s) applied):	0.300
Purpose of data:	Calculation of baseline missions
Additional comment:	N/A

Data / Parameter:	EFb,fuel, N_2O
Unit:	t N_2O/TJ
Description:	N_2O emission factor of the wood fuel
Source of data:	IPCC Default emission factor[13]
Value(s) applied):	0.004
Purpose of data:	Calculation of baseline emissions
Additional comment:	N/A

Data / Parameter:	GWP
Unit:	Fraction
Description:	Global Warming Potential of CH4[14]
Source of data:	IPCC Third Assessment Report: Climate Change 2001
Value(s) applied):	21 25
Purpose of data:	Calculation of baseline emissions
Additional comment:	The PP has used the value 21 for CH4 GWP for the monitoring period before 1st January 2013 and 25 for the period after 1st January 2013. This is in accordance to Gold Standard rule on GWP for project activities.[15]

[12] 2006 Guidelines, Vol. 2, Ch. 2, Table 2.5

[13] 2006 Guidelines, Vol. 2, Ch. 2, Table 2.9

[14] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

[15] http://www.goldstandard.org/wp-content/uploads/2011/09/Global-Warming-Potentials-for-Gold-Standard-Project-Activities-2013.pdf

Data / Parameter:	GWP
Unit:	Fraction
Description:	Global Warming Potential N_2O[16]
Source of data:	IPCC Third Assessment Report: Climate Change 2001
Value(s) applied):	310 298
Purpose of data:	Calculation of baseline emissions
Additional comment:	The PP has used the value 310 for N2O GWP for the monitoring period before 1st January 2013 and 298 for the period after 1st January 2013. This is in accordance to Gold Standard rule on GWP for project activities

D.2. Data and parameters monitored

Data / Parameter:	Qp,y
Unit:	Litres per person per day
Description:	Quantity of safe water in litres consumed in the project scenario p and supplied by project t technology per person per day
Measured/ Calculated / Default:	Measured
Source of data:	Water Consumption Field Tests
Value(s) of monitored parameter:	6.23~~0~~4
Monitoring equipment:	Calibrated Buckets for measuring water
Measuring/ Reading/ Recording frequency:	Annual, 3 consecutive days of the monitoring exercise with exception of holidays
Calculation method (if applicable):	The Water Consumption Field Test results were collected for three consecutive days in each household included in the sample frame. An average of this was then obtained. The figure was then divide by the average number of people in the household.
QA/QC procedures:	The enumerators were provided with calibrated buckets to ensure they took accurate measurements during the WCFT protocol. To ensure accuracy, the enumerators were advised to read calibrated units less of top most numbers which could be easily read.
Purpose of data:	Calculation of baseline emissions.
Additional comment:	N/A

Data / Parameter:	Qp,y
Unit:	Litres of safe water produced per day from project technology
Description:	Quantity of safe water supplied in the project scenario p using the Large Scale Community SAM Filter
Measured/ Calculated / Default:	Measured
Source of data:	No SAM filters has been sold during this monitoring period, So this parameter is not monitored
Value(s) of monitored parameter:	No SAM filters has been sold during this monitoring period

[16] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

Monitoring equipment:	No SAM filters has been sold during this monitoring period
Measuring/ Reading/ Recording frequency:	No SAM filters has been sold during this monitoring period
Calculation method (if applicable):	No SAM filters has been sold during this monitoring period
QA/QC procedures:	No SAM filters has been sold during this monitoring period
Purpose of data:	Calculation of baseline emissions.
Additional comment:	N/A

Data / Parameter:	Cj
Unit:	%
Description:	Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it (b)
Measured/ Calculated / Default:	Calculation
Source of data:	Monitoring Surveys
Value(s) of monitored parameter:	8%
Monitoring equipment:	Open ended questionnaires in monitoring surveys & Literature Review
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	The total number of households who consumed safe water in the baseline scenario was obtained. Based on the feedback from the monitoring surveys, 5 households were already consuming safe water without boiling This number was then divided by the total number of households sampled (137) and the percentage obtained. A conservative estimate of 8% has been selected however to correlate the project boundary with broader estimates from Kisii County.
QA/QC procedures:	N/A
Purpose of data:	Calculation of baseline emissions, Calculation of Project emissions
Additional comment:	N/A

Data / Parameter:	Qp, clean,boil,y
Unit:	Litres per person per day
Description:	Quantity of safe water boiled in the project scenario p per person per day
Measured/ Calculated / Default:	Calculated
Source of data:	Water Consumption Field Test
Value(s) of monitored parameter:	0
Monitoring equipment:	Calibrated Buckets for measuring water
Measuring/ Reading/ Recording frequency:	Annually

Calculation method (if applicable):	The amount of filtered water boiled was obtained for the three consecutive days during the water consumption field test before the water was poured into the boiling pot. An average of this amount was then obtained and divided by the average number of people in the household.
QA/QC procedures:	The enumerators were trained how to accurately measure this parameter using calibrated buckets. The households were advised not to boil the water before the enumerators measured it.
Purpose of data:	Calculation of project emissions
Additional comment:	N/A

Data / Parameter:	Qp, rawboil,y
Unit:	Litres per person per day
Description:	Quantity of raw water boiled in the project scenario p per person per day
Measured/ Calculated / Default:	Calculated
Source of data:	Water Consumption Field Test
Value(s) of monitored parameter:	0 All the households which boiled raw water had discontinued use of the biosand filters and are as such ineligible to be included in the ER calculations since there are already discounted by virtue of the usage factor.
Monitoring equipment:	Calibrated Buckets for measuring water
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	The amount of raw water boiled was obtained for the three consecutive days during the water consumption field test before the water was poured into the boiling pot. An average of this amount was then obtained and divided by the average number of people in the household.
QA/QC procedures:	The enumerators were trained how to accurately measure this parameter using calibrated buckets. The households were advised not to boil the water before the enumerators measured it.
Purpose of data:	Calculation of baseline emissions and calculation of project emissions
Additional comment:	N/A

Data / Parameter:	Np,y
Unit:	Person.days
Description:	Number of persons consuming water supplied by project scenario p through year y
Measured/ Calculated / Default:	Calculated
Source of data:	Water Consumption Field Test
Value(s) of monitored parameter:	2091~~1075~~
Monitoring equipment:	Open ended questionnaires in monitoring surveys
Measuring/ Reading/ Recording frequency:	Annually

Calculation method (if applicable):	Households were asked the number of people living in their household for that particular day in the three consecutive days during the water consumption field test. An average of this number was then obtained for each household and an average of total obtained. The figure was multiplied by 365 days in an year to obtain the figure.
QA/QC procedures:	The number of people living in an household for the three consecutive days during the water consumption field test was obtained to capture the differences in the household number of people throughout the year.
Purpose of data:	Calculation of baseline emissions
Additional comment:	N/A

Data / Parameter:	Up,y
Unit:	Percentage
Description:	Usage rate in project scenario p during year y. This data will be used to account for households which discontinue use of the filters from the monitored sample frame and thereafter be extrapolated across the total sales record.
Measured/ Calculated / Default:	Calculated
Source of data:	Usage Survey
Value(s) of monitored parameter:	2011 = 55.51~~60.01~~% 2012 =57.58~~62.52~~% 2013 = 58.56~~63.10~~% 2014 =58.27~~62.64~~%
Monitoring equipment:	Monitoring Surveys
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	The PP has provided excel based calculations that demonstrate the calculation of the usage parameter. The usage parameter for each vintage was calculated by getting the fraction of users in the sample frame for that vintage and getting the percentage in relation to the total in the sample frame. Thereafter, the weighted average per vintage was obtained by extrapolating the usage in the sample per vintage into the entire population of the TSR for that particular vintage. Each of the usage rates for each vintage was then used for calculation of emission reduction.
QA/QC procedures:	The guidance questions in section 4 of the usage survey clearly determined the operational and non-operational filters in the project scenario.
Purpose of data:	Calculation of total emission reductions
Additional comment:	For the 2014 vintage, since no monitoring was done, the PP used a conservative estimate of the Usage parameter, which was, obtained as an average of the usage rates for the other vintage years.

Data / Parameter:	Quality of the treated water
Unit:	N/A
Description:	Performance of BSF filters shall be based on percentage reduction of E.Coli in the BSF Filters examined through field tests in the project boundary .
Measured/ Calculated / Default:	Measured
Source of data:	Water Quality Tests
Value(s) of monitored parameter:	Results of the water quality tests are provided in the monitoring summary sheet

Monitoring equipment:	Field Laboratory Tests
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	N/A
QA/QC procedures:	The water test results are compared against values provided for different parameters under the First Schedule (r.5) – Quality Standards for Sources of Domestic Water of The Environmental Management And Co-Ordination (Water Quality) Regulations, 2006
Purpose of data:	Sustainable development Monitoring; Methodological Requirement
Additional comment:	The water quality tests were conducted using 3M Petrifilm Plate instructions. Water samples were collected from raw water and water filtered using the project technologies to determine coliform levels in both water samples. A description of the water testing method is described in the section below.

Data / Parameter:	Water Treatment Practices in the baseline scenario
Unit:	Treatment Descriptions
Description:	This parameter will be collated so as to describe water treatment practices in the baseline scenario.
Measured/ Calculated / Default:	N/A
Source of data:	Monitoring surveys
Value(s) of monitored parameter:	N/A
Monitoring equipment:	Monitoring survey
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Households were asked their baseline water treatment before they obtained the water filter. Appropriate answers were then put in the surveys.
QA/QC procedures:	Multiple options in an open ended questionnaire so as to eliminate any possibility of bias.
Purpose of data:	Calculation of baseline emissions
Additional comment:	This question was used to determine suppressed demand. Where households informed they didn't treat water before getting the water filter, the enumerators asked them their likely treatment option of the barrier was removed. Appropriate answers were then provided for in the monitoring survey.

Data / Parameter:	LEp,y
Unit:	t_CO2e per year
Description:	Leakage in project scenario p during year y
Measured/ Calculated / Default:	N/A
Source of data:	Literature Review
Value(s) of monitored parameter:	0

Monitoring equipment:	Monitoring Surveys
Measuring/ Reading/ Recording frequency:	Biennialy
Calculation method (if applicable):	N/A
QA/QC procedures:	There are no perceived monitoring requirements for leakage perceived for this project as has been demonstrated in section B.6.3 of this PDD.
Purpose of data:	Calculation of total emission reductions
Additional comment:	N/A

Gold Standard Sustainable Development Indicators

As outlined in the Gold Standard passport, the following parameters were monitored:

Data / Parameter:	Water quality and quantity: + Positive score
Unit:	%
Description:	This is the quality of filtered water with regards to presence of coliforms in the water. Water quality was assessed by comparing the levels of coliforms in water from raw water and filtered water of the same sample.
Measured/ Calculated / Default:	Measured and then calculated
Source of data:	Water quality testing
Value(s) of monitored parameter:	35 samples have been discounted due to poor results in water quality testing results. These households have E.coli reduction levels in filtered water of less than 90% reduction. 82 samples have E.coli reduction levels greater than 90% and have been counted as safe water supply. In summary, 29.91% of the samples had <90% E.coli reduction, while 70.09% of samples show >90% reduction of E.coli. ~~25 households had E. coli reduction of less than 90%.~~ ~~82 households showed E. coli reduction greater than 90%~~ ~~10 households had erroneous test results due to contamination of samples while out in the field which led to an increase in E. coli in sampled raw water versus sample of filtered water from the respective filter.As a result, these 10 have been discounted for the analysis of water quality testing~~ ~~Summarily, 23.36% of samples had <90% E. coli reduction, while 76.64% of samples show >90% E. coli reduction.~~ .
Monitoring equipment:	3M Petrifilm
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	The total samples showing reduction/increment/no change in coliform levels divided by the total number of samples in the sample frame, multiplied by 100.
QA/QC procedures:	The PP ensured the enumerators were well trained to ensure they didn't contaminate water for the water quality testing. They were provided with cooling jars which were collected from the field within six hours of collection of the samples and then tested with the 3M plates to ensure quality results.

Purpose of data:	Determine if sustainable development has been achieved, with regards to supply of safe drinking water.
Additional comment:	This parameter was monitored biennially for the first monitoring period, but will be monitored annually in the subsequent monitoring periods. The PP has followed the manufacturer specifications for the Biosand water filter that gives a minimum of 90% E. coli reduction in filtered water as approved by the Gold Standard Foundation for this monitoring period.

Data / **Parameter:**	Quality of Employment+ Positive score
Unit:	N/A
Description:	Improvement in the skill level of the community members within the project boundary
Measured/ Calculated / Default:	N/A
Source of data:	Training certificates
Value(s) of monitored parameter:	N/A
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Monitored biennially for the first monitoring period, and annually in subsequent monitoring periods.
Calculation method (if applicable):	N/A
QA/QC procedures:	The trainees from the community are trained by highly skilled personally on various aspects of the project e.g. sales, assembly of the project technology, etc.
Purpose of data:	To ensure that the project has actually brought about sustainable development in the form of better quality of employment.
Additional comment:	N/A

Data / **Parameter:**	Livelihood of the poor + Positive score
Unit:	Percentage
Description:	The parameter refers to the number of people in the project activity whose livelihoods had improved in terms of savings of money used to get fuel and the time used to collect firewood. Households in the sample frame were asked these questions to attesting the same.
Measured/ Calculated / Default:	Calculated
Source of data:	Monitoring Surveys
Value(s) of monitored parameter:	100% of the households interviewed reported reduction in the amount of money used to acquire fuel in the project scenario. 100% of the households interviewed reported reduction in time used to get fuel in the project scenario.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Monitored biennially for the first monitoring period, and annually in subsequent monitoring periods.

Calculation method (if applicable):	Households were asked if there was reduction of time and money used to acquire fuel in the project scenario. If yes, the answer was recorded and same if the household indicated no on the same. Percentages were obtained from the answers provided.
QA/QC procedures:	N/A
Purpose of data:	To ensure that the project has actually brought about sustainable development in the form of improvement of the livelihood of the poor.
Additional comment:	N/A

Data / **Parameter:**	Access to affordable and clean energy services + Positive score
Unit:	N/A
Description:	This parameter refers to the number of people who have had access to affordable and clean energy services in the project scenario.
Measured/ Calculated / Default:	N/A
Source of data:	Total Sales Record.
Value(s) of monitored parameter:	3122 households
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Monitored biennially for the first monitoring period, and annually in subsequent monitoring periods.
Calculation method (if applicable):	N/A
QA/QC procedures:	The PP tracks the number of filters sold in the project boundary. This data is kept in form of hard copies which are then transferred into an electronic sheet. The PP then submits these data sheets to the carbon asset development consultant whom then verifies the information to make sure the data meets the carbon asset standards.
Purpose of data:	Measure sustainable development indicator in terms of access to affordable and clean energy services in the project boundary.
Additional comment:	N/A

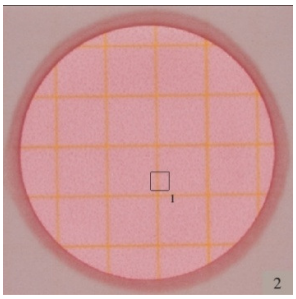
Result:

The PP has provided the Totals Sales Record.

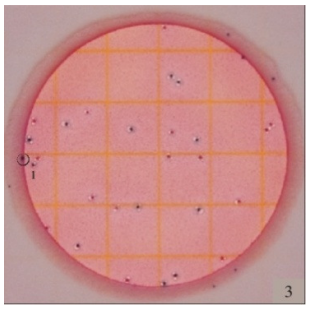
WATER QUALITY TESTING

I. Water Quality Testing Approach

Water quality testing was conducted through the 3M Petrifilm instructions manual. The 3M Petrifilm plate contains Violet Red Bile (VRB) nutrients, a cold-water-soluble gelling agent, an indicator of glucuronidase activity, and an indicator that facilitates colony enumeration. Most E. coli (about 97%) produce beta-glucuronidase which produces a blue precipitate associated with the colony. The top film traps gas produced by the lactose fermenting coliforms and E. coli. About 95% of E. coli produce gas, indicated by blue to red-blue colonies associated with entrapped gas on the Petrifilm EC plate (within approximately one colony diameter). It is therefore relatively easy to detect presence or absence of any population of the E. coli during water quality testing.



No growth = 0



E. coli count = 13

Figure 1: ***Diagrams showing presence and absence of E.coli in a sample of water using the 3M Petrifilm plates***

II. 3rd Party Endorsements

1) CAWST[17]

CAWST – Centre for Affordable Water and Sanitation Technology - a Canadian humanitarian not-for-profit organization that provides education, training and technical consulting in water and sanitation to organizations working with the poor in developing countries.

"The WHO Guidelines cover microbiological, chemical and physical qualities. However, it is stressed that microbiological quality is the most important since this is biggest cause of illness and death around the world. The water quality tests endorsed by CAWST are primarily simplistic in nature. Historically, conventional laboratories were mainly used to carry out water quality testing. Now there is a wide variety of good testing kits and products available in the commercial market that allows you to conduct water quality testing on your own without relying on a laboratory. A significant advantage of field analysis is that tests are carried out on fresh samples whose characteristics have not been contaminated or otherwise changed as a result of being stored and transported over long distances. In rural and remote communities, it is more convenient to carry out water testing on site. However, in practice, it is difficult to transport samples in a way that does not affect their bacteriological quality. Setting up a small laboratory to provide a clean and controlled environment is highly recommended.

Laboratory testing is preferred when carrying out technology verification and preparing water quality guidelines. UNICEF recommends that some complex chemicals such as antimony, barium, cadmium, mercury, molybdenum, selenium and uranium should be tested by a laboratory to achieve a reliable result. However, testing specifically for these chemicals is not usually a concern for the majority of HWTS projects".

3M Petri film is one of the kits recommended by CAWST.

3M Petri film:

There are two procedures for water testing using Petrifilm, but neither are approved international methods. The first procedure recommends the water be filtered through a cellulose acetate filter and the filter be placed on the Petrifilm. This would allow a 100 ml sample to be tested. The filter paper is not included. For this procedure, the gel needs to be prepared ahead of time adding a few extra hours on to the procedure time. If the water sample was really contaminated it could be a challenge to count all the bacteria colonies and the sample may have to be diluted. The second procedure (used by Robert Metcalf) tests a 1 ml sample

[17]http://www.rdic.org/CAWST-Intro-to-Drinking-Water-Quality-Testing.pdf

by placing the sample directly on the Petrifilm. This procedure does not require that the gel be prepared ahead of time. The challenge with this procedure is that sample size is very small and discrepancy is very likely. With any sample larger than 1 ml the water leaks off the film.

2) A PRACTICAL METHOD FOR RAPID ASSESSMENT OF THE BACTERIAL QUALITY OF WATER[18]

In this statement the UN recognizes the need for safe drinking water in communities to avoid disease-causing microbes, such as bacteria and viruses. It recognizes that a new generation of testing E.Coli has been introduced that can be performed in any setting with minimal training. The tests are being used in the most advanced water and food testing labs in developed countries, but they can also be used in remote villages.

The endorsed tests, which include the 3M plates are effective in detecting the presence of E.Coli which is a bacterium that indicates faecal contamination. Its presence in water indicates recent faecal contamination, and the possibility that microbes may also be in the water.

The endorsement explains how to use the Petrifilm test and the expected results.

The Petrifilm tests correlate with the relative risk of disease from drinking-water (WHO Guidelines for Drinking Water, 2nd Edition). The table below shows how this risk assessment is done.

Table 1: Risk assessment of water sources

Risk level	*E. coli*/sample	Colilert fluorescence	Petrifilm # Blue&gas
Low	< 1/10 ml	-	0
Moderate	1-10/10 ml	+	0
High	1-10/ml	+	1-10
Very High	>10/ml	+	>10

If there are no blue colonies with gas bubbles on the Petrifilm, the risk of disease is low, if the Petrifilm remains clear, the risk is moderate and if between 1 and 10 blue colonies with gas appear on the Petrifilm, the risk is high.

The E.Coli count Petrifilm is a reliable, sample ready medium system for enumerating E.Coli and Coliforms. E.Coli Count Petrifilm contains:

- Violet red bile nutrients, which includes lactose. The bile salts and crystal violet in the medium inhibit gram positive bacteria.
- A cold water soluble gelling agent.
- A glucuronidase indicator (BCIG, 5-bromo-4 chloro-3 indolyl-beta D Glucuronide) to identify E.Coli(the same enzyme which hydrolyzes MUG in the Coli rent test.
- A tetrazolium indicator which Gram negative bacteria reduce to a red colour to enhance colony visualization.

All coliform indicator ferment lactose to produce gas bubbles. The bubbles are trapped around the coliform colony. This will distinguish coliform bacteria from other gram negative bacteria which do not produce gas bubbles from lactose.

In addition, glucuronidase produced by most E.Coli, will hydrolyze the Glucuronide from BCIG. The BCI produces a blue colony allowing visual identification of E.Coli coliform colonies which are red with gas bubbles.

III. Testing Approach Appropriateness

The 3M Petrifilm water testing approach has an informative technology which produces productivity, consistency, easy to use and producing best results.

Benefits of 3M Petrifilm[19]

- 80 % productivity.

[18]http://mirror.unhabitat.org/pmss/getElectronicVersion.aspx?nr=3056&alt=1

[19]http://vimeo.com/28951486

- Greater consistency
- Longer Shelf life
- 85% confirmed coliform result in 24 hours.
- Effective in coliform count

The 3m Plates perform similar to standard water testing requirements as found in

1) ISO 6222
2) ISO 9308
3) The U.S FDA Bacteriological Analytical Manual(BAM)
4) APHA Standard methods for the examination of Water and waste water.

IV. Water quality testing results

The PP has used the manufacturer specifications to determine the acceptable efficiency of the E.coli removal capacity of the Biosand filter. The minimum percentage removal of E. coli is given as 90%. From the water quality testing conducted, ~~23.36%~~29.91% of the samples showed percentage removal less than 90%, ~~76.64~~70.09% of the samples showed E. coli removal of greater than 90%. Some samples showed increase in E.oli levels in filtered water versus raw water. The PP has attributed this to sample tampering in the field and has discounted these samples as usable for this analysis.

The PP has provided the water quality testing results in the monitoring survey data summary attached as an appendix to this monitoring report.

D.3. Implementation of sampling plan

>>

1. Description of Implemented Sampling Design

As outline in the PDD, Simple Random Sampling method was used to determine the random test subjects from the total sales record. The total sales record outlined the two counties; Uasin Gishu and Kisii with the operational BioSand Filters which are the only project technologies monitored during this monitoring exercise.

Sample Size Determination:
As illustrated in the PDD, a total of 137 households for the Bio Sand Filters were initially selected for this monitoring period. There were no HH SAM cluster Units nor Large Scale Community SAM filter units monitored in this monitoring period.

The following method was used to determine the 137 sampling units:

1. A list of the geographical regions in the total sales record and the total number of filters sold in these regions was determined. The two geographical regions included the Uasin Gishu and the Kisii counties in the Republic of Kenya.
2. Cumulative sum of all the BSF filters sold was determined which summed to 3122 BSF Filters installed in households.
3. A sample size of 137 was determined as illustrated above. Since the project technologies have different age sets, the PP determined a minimum of 30 sampling units in each age group[20]. 30 samples were determined in the first age group (2009-2010), 36 in the second age group(2010-2011), 36 in third age group(2011-2012) and 35 in the fourth age group(2012-2013).
4. The total number of filters sold in the respective age groups was then divided by the sample size chosen for that particular age group. This result determined the Sample Interval.
5. A random number was determined between 1 and the Sample Interval was which gave the Random Start.
6. Sample units were then determined as
    a) SU1=RS
    b) SU2=RS+S1
    c) SUN=RS+(n-1)SI

[20]http://www.goldstandard.org/wp-content/uploads/2011/10/GS_110411_TPDDTEC_Methodology.pdf

7. The identified sample units were then identified with corresponding household in the Total Sales Record which provided the name of the household and the details of the location of the household.

However, the sample size utilized for analysis of this monitoring period has increased from 137 to 167. This is because approximately 30 households were substituted (based on random selection) due to unavailability of the intended households during the monitoring exercise. Rather than discounting the 30 replaced households as non-users, the PP made follow up calls to these households to ascertain that the household still resides in the project boundary and utilizes the filter. The feedback obtained was 17 of these households maintained they are still using the filters and reside within the project boundary, 4 households have completely abandoned their Biosand filters and 9 households are still untraceable.

The Total sales record provided as a supporting document gives the total sample size per vintage year with the additional households.

Monitoring of the ACF Large Scale SAM Units

As explained in this monitoring report under section C, large scale SAM Units shall not be monitored during this crediting period.

Procedures for Administering Data Collection and Minimising Non Sampling Errors

1. Procedures for Data Collection

The Carbon Asset Development Consultant, Viability Africa, conducted trained the enumerators on the monitoring questionnaire administration and the water filed testing protocol. A key emphasis was given on the usage survey where enumerators were supposed to have observational units with the household members and also conduct spot checks on the project technologies. The enumerators were also informed, where household members present were children under the age of 12 years, a revisit was to be done to interview older respondent and if none was available at all, the survey was treated as non responsive.

Figure 2: Enumerators being trained on the monitoring survey administration

Figure 3: Enumerator training on the water field testing protocol

Figure 4: Enumerator training on water sample collection

2. Data Collected

- The data collected from the field exercise included the following information:
- Basic Information of the Household
- Usage survey information
- Sustainable Development Indicators
- Water Consumption Field Test
- Water Quality Results

The enumerators submitted the questionnaires from the field in hard copies to the project proponent. They were also supposed to collect water samples from the household, store them in unique transportation bags and collect them at the field lab within a period of 6 hours to ensure qualitative results.

The project Proponent, ACF, conducted the water quality testing using the water samples collected by the enumerators. They then filled in the results in the appropriate section in the monitoring survey.

The monitoring surveys was then submitted to Viability Africa in hard copies and then stored electronically. A summary of the data collected is submitted as an appendix to this monitoring report.

Quality Control/Quality Assurance

To ensure quality control and quality assurance, the following was implemented;

1. Viability Africa, the carbon asset development consultant conducted random in house checks on the survey team to ensure adherence to the set protocol in interviewing the project technologies end users and conducting the water quality tests.

2. Data entry and evaluation was conducted by Viability Africa within 24 hours of sample exercise collection

3. Data was controlled and Managed solely by Viability Africa to avoid erroneous entries.

4. The water quality tests were conducted at controlled lab tests to avoid contamination and ensure consistency of results. Every survey team member collected the sample water sachets in every household, stored them in unique transportation bags and collected them at the lab test within a period of 6 hours to ensure qualitative results.

Data Analysis

Data was analysed solely by the Carbon Asset development consultant Viability Africa LLC. Data analysis is presented in the second tab of the summary data.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>> Baseline Emissions are calculated as follows:

$$BE_{b,y} = B_{b,y} * ((f_{NRB,b,y} * EF_{b,fuel,CO2}) + EF_{b,fuel,nonCO2}) * NCV_{b\ fuel}$$

In accordance to Gold Standard requirements on Global warming potentials for project activities, all monitoring, verifications and requests for issuance from Gold Standard Certified Emission Reductions (GS CERs) and GS VERs that fall within the second commitment period (form 1st Jinuary 2013) will be calculated using the revised GWPs. Projects emission reductions accrued before 1st January 2013 will use the former GWP values.[21]

Consequently, the PP has divided the monitoring period from 28th Dec 2011 to 31st December 2012 to use GWP values from the IPCC's 2nd Assessment Report for CH4 and N2O. From 1st January 2013 henceforth, the PP has employed the revised values for the GWP for CH4 and N20.

Fuel used to Treat water Bby

Bb,y = (1 - Cj) * Nj,y * Wb,y * (Qj,y + Q j,rawboil,y)

Where:

Nj,y	Number of person.days consuming water supplied by project scenario p through year y
Cj	Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it
Bb,y	Quantity of fuel consumed in baseline scenario b during the year y in tons
Qp,y	Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day
Qp, raw,boil,y	Quantity of raw water boiled in the project scenario p per person per day
Wb,y	Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test.

Therefore;

Nj,y= 5.737~~666~~*365=~~2~~22091~~105~~
Cj= 8%
Wby= 0.000417848
Qp,y= 6.230~~~~
Qp, rawboil,y=0

[21] http://www.goldstandard.org/wp-content/uploads/2011/09/Global-Warming-Potentials-for-Gold-Standard-Project-Activities-2013.pdf

Bb, y is therefore calculated as:

= (1-0.08)*~~2105~~2091*0.000417848*(6.2~~34~~+0)
=5.0~~09~~ tonnes

Vintage Year 2011
BEy= Bby*(fNRB,b,y* EFb,fuel,CO2)+(EFb,fuel,CH4+ Efb,fuel,N2O)* NCV bfuel

fNRB, b, y=0.92
EFb, fuel, CO2=112
EFb, fuel, CH4=6.3(0.3*21)
Efb, fuel, N2O=1.24 (0.004*310)
NCVb, fuel=0.015

=8.308~~7~~ tCO_2e (per filter, per year)

Vintage Year 2012
BEy= Bby*(fNRB,b,y* EFb,fuel,CO2)+(EFb,fuel,CH4+ Efb,fuel,N2O)* NCV bfuel

fNRB, b, y=0.92
EFb, fuel, CO2=112
EFb, fuel, CH4=6.3(0.3*21)
Efb, fuel, N2O=1.24 (0.004*310)
NCVb, fuel=0.015

=8.308~~7~~tCO_2e (per filter, per year)

Vintage year 2013
BEy= Bby*(fNRB,b,y* EFb,fuel,CO2)+(EFb,fuel,CH4+ Efb,fuel,N2O)* NCV bfuel

fNRB, b, y=0.92
EFb, fuel, CO2=112
EFb, fuel, CH4=7.5(0.3*25)
Efb, fuel, N2O=1.192 (0.004*298)
NCVb, fuel=0.015

=8.3954~~6~~ tCO_2e (per filter, per year)

Vintage year 2014
BEy= Bby*(fNRB,b,y* EFb,fuel,CO2)+(EFb,fuel,CH4+ Efb,fuel,N2O)* NCV bfuel

fNRB, b, y=0.92
EFb, fuel, CO2=112
EFb, fuel, CH4=7.5(0.3*25)
Efb, fuel, N2O=1.192 (0.004*298)
NCVb, fuel=0.015

=8.3954~~6~~ tCO_2e (per filter, per year)

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>Project Emissions are calculated as follows:

$$PE_{p,y} = B_{p,y} * ((f_{NRB,p,y} * EF_{p,fuel,CO2}) + EF_{p,fuel,nonCO2}) * NCV_{p,fuel}$$

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

$B_{p,y}$ = Number of person.days x Project Fuel used to boil water (T/L) x Total volume of water boiled in project scenario (L/p/d)

Where:

Np, y	Number of person.days consuming water supplied by project scenario p through year y
Cj	Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it
Bp, y	Quantity of fuel consumed in project scenario p during the year y in tons
Qp, rawboil, y	Quantity of raw water boiled in the project scenario p per person per day
Qp, cleanboil,y	Quantity of safe water boiled in the project scenario p per person per day
Wp,y	Quantity of wood fuel or fossil fuel in tons required to treat 1 litre of water using technologies representative of the project scenario p during project year y

Therefore;

Nj, y= 5.73 ~~76666~~*365=2091~~105~~
Cj= 8%
Wby= 0.000417848
Qp, clean boil, y= 0
Qp, rawboil, y=0

Bp, y is therefore calculated as:

= (1-0.08)*2091~~105~~*0.000417848*(0+0)
=0.06185 tonnes

Vintage Year 2011

PE,y= Bp,y*(fNRB,b,y*EFb,fuel,CO2)+(EFb,fuel,CH4+Efb,fuel,N2O)*NCVbfuel

fNRB, b,y=0.92
EFb, fuel,CO2=112
EFb, fuel,CH4=6.3(0.3*21)
EFb, fuel,N2O=1.24 (0.004*310)
NCVbfuel=0.015

=0.103 tCO_2e (per filter, per year)

Vintage Year 2012

PE,y= Bp,y*(fNRB,b,y*EFb,fuel,CO2)+(EFb,fuel,CH4+Efb,fuel,N2O)*NCVbfuel

fNRB, b,y=0.92
EFb, fuel,CO2=112
EFb, fuel,CH4=6.3(0.3*21)
EFb, fuel,N2O=1.24 (0.004*310)
NCVbfuel=0.015

=0.103 tCO_2e (per filter, per year)

Vintage Year 2013

PE,y= Bp,y*(fNRB,b,y*EFb,fuel,CO2)+(EFb,fuel,CH4+Efb,fuel,N2O)*NCVbfuel

fNRB, b,y=0.92
EFb, fuel,CO2=112
EFb, fuel,CH4= 7.5(0.3*25)
EFb, fuel,N2O= 1.192(0.004*298)
NCVbfuel=0.015

=0.104 tCO_2e (per filter, per year)

Vintage year 2014

PE,y= Bp,y*(fNRB,b,y*EFb,fuel,CO2)+(EFb,fuel,CH4+Efb,fuel,N2O)*NCVbfuel

fNRB, b,y=0.92
EFb, fuel,CO2=112
EFb, fuel,CH4= 7.5(0.3*25)
EFb, fuel,N2O= 1.192(0.004*298)
NCVbfuel=0.015

=0.104 tCO_2e (per filter, per year)

E.3. Calculation of leakage

>>Leakage = 0
As demonstrated in section B.6.3 of the PDD as well as this monitoring report, there are no perceived leakage risks for this parameter

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e) (per filter, per year)	Project emissions or actual net GHG removals by sinks (t CO_2e) (per filter, per year)	Leakage (t CO_2e) (per filter, per year)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e) (per filter, per year)
Total	8.308 ~~8.40~~ Tco2(Year 2011)	0.103 Tco2 (Year 2011)	0	**4.55 ~~96~~ Tco2 (Year 2011)**
	8.308 ~~8.40~~ Tco2 (Year 2012~~1~~)	0.103 Tco2 (Year 2012~~1~~)		**~~5.17~~ 4.72 TCO2 (Year 2012)**
	8.395 ~~8.489~~ Tco2 (Year 2013~~1~~)	0.104 Tco2 (Year 2013~~1~~)		**4.86 ~~5.27~~ TCO2 (Year 2013)**
	8.395 ~~8.489~~ Tco2 (Year 2014~~1~~)	0.104 Tco2 (Year 2014~~1~~)		**4.83 ~~5.24~~ TCO2 (Year 2014)**

Overall GHG were calculated as follows:

The overall GHG reductions are calculated as follows:

$$ER_y = (\sum BE_{b,y} - \sum PE_{p,y}) * U_{p,y} - \sum LE_{p,y} \quad (13)$$

Where:

$U_{p,y}$ Cumulative usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate.

Weighted Useage Rate Calculation:

A total of 72~~165~~ entries have been disqualified as non-users due to filter abandonment, filtered water not meeting the standard for safe drinking water and other disqualifications based on the success/ failure rate in the registered PDD.~~, with 24 households having abandoned their filters completely, and 25 having water quality results of <90% E.coli reduction ,9 households replaced as a result of untraceable households and 7 households disqualified as not meeting qualifications in the registered PDD.~~ The weighted Usage parameter has been calculated across the vintage years as shown below:

Step 1: The non-users and users per vintage in each sample frame was determined from the sample frame.
Step 2: The PP then determined the usage rate per vintage using the following calculation:
Upy $_{vn}$ = (Users /Total Filters in the sample in Vintage year 1)*100
This is done for all vintages
Step 3: The PP then determined the useable filters in each vintage in the Total sales record using the percentage usage rate per vintage.
Usable Filters $_{vn}$ = Usage rate in vintage * Total number of filters sold in that vintage year in the Total sales record.
Step 4: The weighted Usage parameter is achieved by:
= (Total Usable filters in all the vintages/Total filters sold in the project for the respective vintage years) *100

Where:
Vn = Vintage year N

Calculations:

Usage rate	**Age Group**	**Year 2011**	**Year 2012**	**Year 2013**	**Year 2014**
	1	~~60~~56%	~~60~~ 56 %	~~60~~56%	~~60~~56%
	2	~~60~~55%	~~60~~55%	~~60~~55%	~~60~~55%
	3		~~73~~66%	~~73~~66%	~~73~~66%
	4			62%	62%
	5				4~~2~~5%
Installation	**Age Group**	**Year 2011**	**Year 2012**	**Year 2013**	**Year 2014**
	1	617	1010	791	304
	2	400	617	1010	791
	3		400	617	1010
	4			400	617
	5				400
Total		1017	2027	2818	3122
		~~62.01~~55.51%	**~~62.52~~57.58%**	**~~63.10~~58.56%**	**~~62.64~~58.27%**

The difference of the Baseline emissions and the project emissions is multiplied by the usage rate to get the Emission reductions per filter in each vintage year.

Summary of ERs Accrued in this monitoring period:

Period	Emission Reduction (tCO2e)
28/12/2011-31/12/2011	67 ~~74~~
1/1/2012-31/12/2012	9,373 ~~10,306~~
1/1/2013-31/12/2013	13,809 ~~14,824~~
1/1/2014-21/07/2014	8,251 ~~8,1938,941~~
Total	31,500 ~~34,145~~

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	**66,054**tCO2e	**3**1,500 ~~3~~4,145

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

>> The values estimated in the ex-ante calculations were higher than the actual values achieved during this monitoring period. The reason for this difference in numbers is:

1. The annual filter sales estimated per annum in the ex-ante scenario were higher than the filter in the monitoring period. As a result, the emission reductions in the ex-ante projections were higher than the emission reductions in this monitoring period.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	9,440 ~~10,380~~ tCO2e	22,060 ~~23,765~~ tCO2e

- - - - -

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for completing the CDM-MR-FORM
Organization name	AquaClara Foundation
Street/P.O. Box	Howard Avenue
Building	Michigan State University Bioeconomy Institute
City	Holland
State/Region	Michigan
Postcode	49424
Country	United States of America
Telephone	+ 1 616 540 4094
Fax	+ 1 616 774 8017
E-mail	hsknopke@sbcglobal.net
Website	http://aquaclara.org/
Contact person	
Title	President
Salutation	Dr. (Ph.D.)
Last name	Knopke
Middle name	J
First name	Harry
Department	Management
Mobile	-
Direct fax	-
Direct tel.	+ 1 616 540 4094

Document information

Version	*Date*	*Description*
(c)		
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		