Monitoring report form for CDM programme of activities

(Version 02.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the PoA	Impact Carbon Global Safe Water Programme of Activities (PoA)	
UNFCCC reference number of the PoA	9948	
Version numbers of the PoA-DD applicable to this monitoring report	07	
Version number of this monitoring report	Impact Carbon	
Completion date of this monitoring report	04/10/2017	
Monitoring period number	Monitoring Period – 1	
Duration of this monitoring period	02/05/2014 – 31/08/2017	
Monitoring report number for this monitoring period	1	
Coordinating/managing entity		
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Rwanda	Yes
	Uganda	Yes
	Nigeria	Yes
	Kenya	Yes
Sectoral scopes	Sectoral Scope 3: Energy Demand	
Applied methodologies and standardized baselines	AMS-III.AV low greenhouse gas emitting safe drinking water production systems (Version 4)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	NA	135,064 tCO_2e
Amount of GHG emission reductions	135,064 tCO_2e	

or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

>> Households throughout Rwanda, Uganda, and Nigeria lack access to reliably safe drinking water. In Rwanda only 32% of the population use piped water, with only 3.4% having access to piped water within their homes.[1,2] This is especially true of rural areas where only 0.9% of the population have access to piped water within their homes. In Uganda, 64% of rural households have access to an "improved water source," including protected springs and piped water schemes; however, none of these systems consistently supply safe water as they are not treated and contamination is frequent, particularly during the rainy season. While urban areas are serviced by piped water systems, in both Rwanda and Uganda piped water systems are often in disrepair due to aged systems and insufficient capacity for operation and maintenance.[3,4,5] Further, an official in Uganda stated that there is a potential for bias in government reporting on their initiatives to provide safe water, noting that most think it is preferable to report that the situation is positive, regardless of the reality.[6] Sector experts throughout Uganda and Rwanda corroborate that the water consumed at the household level should not be considered safe to drink and should be treated.[7,8]

In Uganda, 43.9% of households boil their water to treat it, with 95.5% of all households using biomass for cooking and boiling water.[9] The vast majority of the woody biomass in Uganda, with the national fraction of non-renewable biomass lying around 0.82 in Uganda[10]. The high proportion of non-renewable biomass demonstrates that typical household water boiling contributes to deforestation and threatens biodiversity. With significant portions of the population using unimproved cooking stoves – 87.6% in Uganda[11], many families that purify water through boiling are left vulnerable to the negative effects associated with the emission of greenhouse gases, while those that do not boil, or only boil occasionally, suffer from waterborne diseases. Traditional stoves and diseases induced from unsafe drinking water account for 19,700 and 27,200 deaths

[1] National Policy & Strategy for Water Supply and Sanitation Services, Rwanda Minist*ry* of Infrastructure. Page 7

[2] Water Supply and Sanitation in Rwanda. Turning Finance into Service for 2015 and beyond. AMCOW Page 19

[3] National Policy & Strategy for Water Supply and Sanitation Services, Rwanda Ministry of Infrastructure. Page 7

[4] Water Supply and Sanitation in Rwanda. Turning Finance into Service for 2015 and beyond. AMCOW Page 19

[5] Ministry of Water and Environment, Water and Environment Sector Report 2012, p. 114

[6] Validation Site Visit Interview: Ministry of Water and Environment, Uganda, 13/3/2013

[7] Validation Site Visit Interview local expert: Daniel Allolya, Tiva Water, 13/9/2013

[8] Validation Site Visit Interview: Julius Ecuru, Academic, 20/9/2013

[9] Uganda Demographic Health Survey 2011

[10] Default Values of Fraction of Non-Renewable Biomass http://cdm.unfccc.int/DNA/fNRB/index.html

[11] Uganda National Household Survey 2009/2010, Uganda Bureau of Statistics, p.118

respectively in Uganda[12,13]. Indoor smoke is one of the underlying causes and to blame for nearly 800,000 child deaths annually. These deaths are not equally distributed throughout the world: more than one third of the child deaths due to indoor smoke, that is 358,000 deaths, occur on the African continent, and another 288,000 child deaths occur in South-East Asia[14]

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
CPA type 1: Small-scale technologies for household water consumption, no project emissions	7.0	Sectoral scope 3: Energy demand	AMS-III.AV: "Low greenhouse gas emitting safe drinking water production systems" Version 4
CPA type 2: Technologies for Institutional water consumption, no project emissions	7.0	Sectoral scope 3: Energy demand	AMS-III.AV: "Low greenhouse gas emitting safe drinking water production systems" Version 4
CPA type 3: Technologies for institutional water consumption, with project emissions	7.0	Sectoral scope 3: Energy demand	AMS-III.AV: "Low greenhouse gas emitting safe drinking water production systems" Version 4
CPA type 4: Technologies for communitywater consumption, with no project emissions	7.0	Sectoral scope 3: Energy demand	AMS-III.AV: "Low greenhouse gas emitting safe drinking water production systems" Version 4

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
9948-0001-Impact Carbon Global Safe Water Programme of Activities (PoA): CPA 1	CPA type 3: Technologies for institutional water consumption, with project emissions	7.0	Renewable 30/05/2014 – 29-05-2021	Yes
9948-0002-Impact Carbon Global Safe Water Programme of Activities (PoA): CPA 2	CPA type 3: Technologies for institutional water consumption, with project emissions	7.0	Renewable 30/05/2014 – 29-05-2021	Yes
9948-0003- Impact Carbon Global Safe Water Programme of Activities (PoA): CPA 3	CPA type 3: Technologies for institutional water consumption, with project emissions	7.0	Renewable 30/03/2017 – 29-03-2024	Yes
9948-0004-Impact Carbon Global Safe Water Programme of Activities (PoA): CPA 4	CPA type 3: Technologies for institutional water consumption, with project emissions	7.0	Renewable 15/06/2017 – 14-06-2024	Yes

[12] WHO: Country Profile of Environmental Burden of Disease 2009: Rwanda

[13] WHO: Country Profile of Environmental Burden of Disease 2009: Uganda

[14] http://www.who.int/indoorair/publications/fuelforlife.pdf

A.2. Coordinating/managing entity

Coordinating/managing entity and/or responsible person/entity	☒ Coordinating/managing entity ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization	Impact Water
Street/P.O. Box	582 Market Street
Building	Suite 1204
City	San Francisco
State/Region	California
Postcode	94104
Country	United States
Telephone	+1 415 968 9087
Fax	-
E-mail	ehaigler@impactcarbon.org, info@impactwater.co
Website	www.impactcarbon.org
Contact person	Evan Haigler
Title	Project Development Director
Salutation	-
Last name	Haigler
Middle name	-
First name	Evan
Department	-
Mobile	-
Direct fax	-
Direct tel.	-
Personal e-mail	-

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

>> The PoA follows AMS-III.AV low greenhouse gas emitting safe drinking water production systems Version 4. As this is a small-scale methodology, each CPA under the PoA will achieve emission reductions below 60,000 tCO_2e per annum. Low greenhouse gas emitting water purification systems (WPS) reduce fossil fuel and non-renewable biomass use, relative to the baseline scenario, thereby achieving emission reductions.
The PoA will include five distinct CPA types, including the following combinations of water purification technology types and user groups:

1) Small-scale technologies for household water consumption, with no project emissions
Technologies shall be used in households and may include:
• Water filters: e.g. ceramic, membrane, sand, activated carbon, etc.
• Solar disinfection devices
• Chemical disinfection
Technologies are designed for low flow consumption and are ideal for household use.

2) Technologies for institutional water consumption, with no project emissions
Technologies shall be installed in institutions and may include:
• Water Filters
• Solar Disinfection devices
• Chemical Disinfection
• Ultrafiltration Devices

• Ultraviolet disinfection devices with renewable power

Ultraviolet disinfection devices which require electricity shall be installed with solar systems for large-scale consumption in institutions, such as schools or prisons, which lack access to any reliable electricity supply. Monitoring of a sample of solar powered UV disinfection devices shall include confirmation of use according to manufacturer specifications, i.e. not connected to alternate source of energy, as part of the Operational Unitsi parameter. If energy source other than installed solar panel is used, the unit will be considered to be not in use for the monitoring period. Through use of Operational Units parameter, the fraction of units within the sample found using an alternate energy source and considered not in use shall be applied to the population of units of the same technology type.

3) Technologies for institutional water consumption, with project emissions

Technologies shall be installed in institutions and result in project emissions. Technologies may include:

• Ultraviolet disinfection devices
• Reverse Osmosis systems

Technologies shall not be installed with a solar PV system for electricity supply. While the target group is identical to CPA type 2, as the technologies generates project emissions, it must be considered as a separate CPA type.

4) Technologies for community water consumption, with no project emissions

Technologies shall be installed in community centers that have variable users, such as restaurants, villages, offices, retail vendors, or health centres and may include:

• Water Filters
• Solar Disinfection
• Chemical Disinfection
• Ultraviolet disinfection devices with renewable power

Community refers to a group of people in close geographic proximity, accessing the same resources and facilities. In the case of CPA type, community applications are applied for technologies used in situations with variable users. Due to variable users and quantity consumed, the quantity of water purified in this CPA type will be measured directly from a representative sample. No technologies in this CPA type result in project emissions.

Ultraviolet disinfection devices which require electricity shall be installed with solar systems for large-scale consumption in community applications, such as restaurants, villages, offices, retail vendors, or health centers, which lack access to any reliable electricity supply. Monitoring of a sample of solar powered UV disinfection devices shall include confirmation of use according to manufacturer specifications, i.e. not connected to alternate source of energy, as part of the Operational Units parameter. If energy source other than installed solar panel is used, the unit will be considered to be not in use for the monitoring period. Through use of Operational Units parameter, the fraction of units within the sample found using an alternate energy source and considered not in use shall be applied to the population of units.

5) Technologies for community water consumption, with project emissions

Technologies shall be installed in community centers that have variable users, such as restaurants, villages, offices, retail vendors, or health centres and result in project emissions. Technologies may include:

• Ultraviolet disinfection devices
• Reverse Osmosis systems

Both technologies may be used in water kiosks. Neither technology type shall not be installed with a solar PV system for electricity supply. While the target group is identical to CPA type 4, as the technologies utilize electricity and generate project emissions, it must be considered as a separate CPA type.

While CPA types are not defined regionally, individual CPAs included will be implemented in one country, and may have a regional focus.

All water purification systems will be distributed to end-users or community leader in case of community target groups directly via a Sales Representative, who collects user or community level information via a Sales Receipt and explain how to correctly use the system. The end-user or

community leader will also be provided with the contact details of the CME/CPA Implementer, whom they can contact should any maintenance of the system be required, or if their contact details (e.g. address) change.

The CME works actively with local partners to improve sales and dissemination strategies; in some cases the CME may be the CPA implementer and will be directly responsible for sales and dissemination. The CME actively brings other local partners into the project to enhance the dissemination and distribution capacity of the project as a whole. Local partners may include but are not limited to NGOs, local entrepreneurs, government organizations and academic institutes. Distribution channels of project technologies will vary based on the partner, but may involve both direct sales to clients from CPA implementers and sales through distribution partners. The CME will oversee all distribution efforts to end users and govern that process through detailed operations manuals with partner organizations. Distribution includes the capture of end user information and appropriate record keeping.

B.2. Post-registration changes to PoA

B.2.1. Corrections

>>N/A

B.2.2. Inclusion of monitoring plan

>> N/A

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

>> N/A

B.2.4. Changes to programme design

>> N/A

PART II Monitoring of CPAs

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

>>**9948-0002(CPA No. 002)**

a) Purpose of the specific-case CPA(s) and the measures taken for GHG emission reductions or net GHG removals by sinks –

Purpose: This CPA invlolves the distribution & installation of improved water filters in Uganda for use by institutions in rural and urban areas of Uganda. The water filter disseminated through this programme reduce the end user dependency on the conventional water filtration technique (i.e. boiling). Boiling of water using cook stoves (mostly unimproved), with charcoal and fuelwood being the fuels of choice, produces GHG emissions and indoor smoke. The institutional water filter lowers greenhouse gas emissions, and reduces the indoor air pollution (i.e. smoke), thereby reducing health hazards on the users.

Measures taken: The CPA 9948-0002 involves marketing, distributing, and creating awareness for institutional water filters for majority of institutions in Uganda, such as Schools, Hospitals, Prisos, etc. The total number of water filters installed under this specific-case CPA till date is:

Institutional Water Filters – 1377.

b) Description of the technology employed and installed equipment and/or infrastructure, including information requested by the eligibility criteria

The project technology is reducing the fuel emissions (GHG emissions due to burning of fossil fuels and charcoal), by providing purified water at the cost of a small amount of electricity consumption, thus falling into the Technologies with project emission category.
The application of technologies distributed under the CPA achieve compliance with “Interim or higher” performance target as per “Evaluating household water treatment options: Health based targets and microbiological performance specifications” (WHO 2011) or a comparable national standard or guideline, per the methodology AMS-III.AV Version 4. All technologies that are distributed under this CPA, have been lab tested to ensure they adhere to these guidelines. Technologies under this CPA have following characteristics:

- Minimum flow rate: 50 L/hr
- Minimum capacity/lifespan: 219,000 L or 1 year
- Fixed or portable: Fixed
- Removal of E.coli: 99 (4-log)
- Minimum Watts/Voltage: 5

Technology Type	Example Technologies	Filtration Capacity Range	Removal of E. Coli	Lifetime
Ultraviolet disinfection device	Nandadeep	300-700 L/hr	>99.9999 (4-log)	10 Years.

An ultraviolet disinfection device uses ultraviolet light at short wavelengths to eliminate microorganisms, without changing the taste or composition of the treated water. Some ultraviolet disinfection device also uses filters to remove suspended particles and improve the turbidity and taste of the water. The UV disinfection systems satisfy WHO compliance for the Guidelines for

Drinking-Water. An example of a specific brand that would be included is Nandadeep, shown below:

Nandadeep UV Disinfection Device

The technology distributed in the CPA is suitable within the context of local water consumption practices, and ensures that potable water is always available for institutional consumption.

C.2. Location of CPAs

>> The geographical boundaries of theCPA includes the rural and urban areas of Uganda, which is registered as the host country of the PoA.

Figure 5 - The physical/geographical boundary of the SSC-PoA (CPA – 2: Uganda): Uganda

The GPS Co-ordinates and location of CPAs are as follows:

CPA 9948-0002

(a) Host Party = Uganda
(b) Region/state/province = All the regions of Uganda
(c) City/town/community = All the cities of Uganda
(d) Latitude and Longitude

	Latitude	Longitude
Northern	4.228950	33.989650
Eastern	1.925300	35.044333
Southern	-1.481383	29.915233
Western	-1.186633	29.572667

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines

>>N/A

C.3.2. Corrections

>> N/A

C.3.3. Changes to the start date of the crediting period

>> N/A

C.3.4. Inclusion of monitoring plan

>> N/A

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

>> N/A

C.3.6. Changes to project design

>> N/A

SECTION D. Description of monitoring system of CPAs

>> The project CPA (CPA – 2) apply the same monitoring system for the identification of all Ex post parameters. The monitoring system applied involves a number of key elements to ensure that the CME and CPA-Implementer have high-quality, unbiased and reliable information regarding the performance of the project in terms of implementationand outcomes, and for the purposes of calculating CERs following AMS.III.A.V. version 4.0, on the basis of the amount of non-renewable biomass saved by the project technologies in the CPA.

Monitored Systems

1. **Total Sales Record:** The total sales record documents the information listed below for the technologies implemented. A carbon waiver including a warranty card has been distributed with each stove sold.The CME makes every effort to retrieve this information (paper form or electronically (i.e. SMS) but cannot guarantee the collection of information for waivers and warranties with every stove due to challenges such as high rates of illiteracy and logistical challenges. The total sales record has been kept electronically and with supporting evidence from paper records and/or SMS tracking records, and has been provided to the DOE at verification. The Total Sales Record contains:

    a. Unique identification filter serial number
    b. Date of sale and quantity of tank sold with project technology
    c. Address and details of institution, as evidenced by invoices

    Frequency: Continuous

2. Organizational structure of monitoring and inclusions

Person	Role
CME database administrator	The database administrator is responsible for updating and maintaining all electronic databases and inclusions. Required competencies include experience with data management systems (eg. Excel, STATA, or SPSS), minimum 2 years working experience in a similar field, and at minimum a Bachelors degree from an institution of higher education.
Monitoring team	The monitoring team will be assigned by the CME to conduct the user interviews and appliance tests during the periodic sampling and reports the results to the database administrator. The skills and experience required for the data collection activities include: ▪ Experience conducting surveys/tests ▪ Experience conducting door-to-door surveys of biomass consumption ▪ Local language skills (especially important for input to questionnaire design and interviewing of end users) ▪ English language skills ▪ Cultural awareness ▪ Numerical proficiency ▪ Data entry skills

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

Data/Parameter	Case1 or Case 2
Unit	-
Description	Case 1 or Case 2: Project activities implemented in rural or urban areas of countries with proportion of rural or urban population using an improved drinking-water source equal to or less than 60 % (Case1) or above 60% (Case2).
Source of data	Option – III: Using survey methods (Project Monitoring Survey)
Value(s) applied	[Case 1]
Choice of data or measurement methods and procedures	Case 1 and Case 2 will be determined using one of the three options below: (i)Proportion of populations using an improved drinking-water source for the most recent year for which data is available from WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation shall be used (<http://www.wssinfo.org/data-estimates/table/>) for this purpose. Definition of improved and unimproved drinking water source shall be as per the information provided by JMP; (ii)Using official data such as publicly available statistical data from a government agency or an independently commissioned study by an international organization or a university; (iii)Using survey methods (use 90/10 confidence/precision for sampling).
Purpose of data/parameter	Determination of Case 1 or Case 2 for baseline and opting for appropriate emission reductions calculations methods

Additional comments	The project monitoring test values give an indicator for the number of unfit samples in the local pipewater water supply. This can be assessed from the Monitoring Water Survey_v1.0. In tab "Water Quality", cell AQ95 gives the value of safe drinking water samples tested, which comes out to be 44. Now, the number of samples tested was 88, which is 12 shy of proposed monitoring figure of 100. Hence, the deficit can be assumed as the samples which are getting safe drinking water supply. This totals the safe drinking water supply samples to be at 56 out of 100 (i.e. 56% only). Since the minimum requirement for a project activity to fall in Case I project type is <=60% (56%, based on project monitoring survey) safe drinking water supply, the current monitoring proves that the project falls under Case I.

Data/Parameter	WH
Unit	Kj/L.^{o}C
Description	Specific Heat of Water
Source of data	Default Value from AMS-III.AV Version 4
Value(s) applied	4.186
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	T_f
Unit	^{o}C
Description	Final Temperature
Source of data	Default Value from AMS-III.AV Version 4
Value(s) applied	100
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	T_i
Unit	^{o}C
Description	Initial Temperature
Source of data	Default Value from AMS-III.AV Version 4
Value(s) applied	20
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	WHE
Unit	Kj/L
Description	Latent Heat of Water Evaporation
Source of data	Default Value from AMS-III.AV Version 4
Value(s) applied	2,260
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	L
Unit	-
Description	Leakage
Source of data	Default Value from AMS-I.E Version 5
Value(s) applied	1.0
Choice of data or measurement methods and procedures	Methodological default
Purpose of data/parameter	Calculation of leakage emissions
Additional comments	-

Data/Parameter	$R_{y,i}$
Unit	Liters/person/day
Description	Average volume of drinking water per person per day
Source of data	WHO Minimum water quantity needed for domestic use in emergencies.
Value(s) applied	3.5 (for boarding schools, prisons) 2 (for day schools)
Choice of data or measurement methods and procedures	WHO data on the minimum 'survival' allocation for drinking water per a person and water per pupil.[15]
Purpose of data/parameter	Calculation of QPW_y For Case 1: $QPW_y = \sum_{0}^{i} (T_{y,i} \times N_{y,i} \times R_{y,i} \times 365 \times Water\ Quality_i \times Operational\ Units_i)$

[15] http://www.who.int/water_sanitation_health/publications/2011/WHO_TN_09_How_much_water_is_needed.pdf?ua=1

Additional comments	For CPAs the value of QPW_y is subject to a cap derived from the number of total project population for which it can be demonstrated through documentation that the common practice of water purification is or would have been water boiling multiplied by the maximum volume of drinking water per person per day, set at 5.5 litres per person per day. Whilst the cap in the methodology is 5.5 L/person/day, the PoA applies an effective cap of 3.5 l/person/day for boarding schools or prions and 2 l/person/day for day schools, which is more conservative, and a more realistic figure of the quantity of water that would be used for drinking purposes. $N_{y,i}$ multiplied by $R_{y,i}$ shall not exceed the maximum output of the technology [per unit].

Data/Parameter	$EF_{EL,j,y}$
Unit	tCO_2/MWh
Description	Emission factor for electricity generation for source j in year *y* (tCO2/MWh)
Source of data	As per the "Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version 2
Value(s) applied	1.3
Choice of data or measurement methods and procedures	Default value from the "Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version 2: **Scenario A: Electricity system** In this case, project participants may choose among the following options: Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the Tool to calculate the emission factor for an electricity system ($EF_{EL,j/k/l,y}$ = $EF_{grid,CM,y}$). Option A2: Use the following conservative default values: A value of 1.3 tCO2/MWh if (a) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources; or (b) Scenario A applies to both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the project and leakage from sources is greater than the electricity consumption of the baseline sources. Option A2 will be used.
Purpose of data/parameter	To calculate project emissions
Additional comments	To be considered only in the case the water purification device consumes electricity

Data/Parameter	$TDL_{j,y}$
Unit	Fraction
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	As per the "Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version 2

Value(s) applied	20%
Choice of data or measurement methods and procedures	Default value from the "Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version 2
Purpose of data/parameter	To calculate project emissions
Additional comments	To be considered only in the case the water purification device consumes electricity

E.2. Data and parameters monitored

Data/Parameter	QPW_y
Unit	Liters/yr
Description	Quantity of purified water in year *y* (litres)
Measured/calculated/ default	calculated
Source of data	Calculation
Value(s) of monitored parameter	**Year** / **QPW_y (L/yr)**: 1 / 10,230,930; 2 / 21,251,616; 3 / 13,713,036; 4 / 3,661,596
Monitoring equipment	N/A
Measuring/reading/recording frequency	N/A
Calculation method (if applicable)	Calculated through Equation (1.a) For Case 1: $QPW_y = \Sigma(T_{y,i} \times N_{y,I} \times R_{y,I} \times 365 \times Water\ Quality_i \times Operational\ Units_i)$
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$T_{y,i}$
Unit	Number
Description	Total distributed water purification systems
Measured/calculated/ default	Measured
Source of data	Sales invoices database
Value(s) of monitored parameter	The Sales Values are based on the sales figures obtained, and recorded:

Year	**CPA Sales**	**Water Filters**
1	326	326
2	570	570
3	383	383
4	98	98

Monitoring equipment	Sales receipts

Measuring/reading/recording frequency	continuous
Calculation method (if applicable)	The total number of units by technology type and date deployed in each specific CPA is tracked in the Project Database, using Sales Receipts. All units distributed will be recorded. Any unit not recorded in the Project Database will not be credited for emission reductions.
QA/QC procedures	Sales Database is cross-checked with paper records to ensure transparent and robust data. Replacement technologies will be captured in monitoring the number of *Operational Units*$_i$.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$N_{y,i}$
Unit	Persons/equipment
Description	The average population serviced by water purification systems
Measured/calculated/ default	Calculated
Source of data	Sales Receipts/database
Value(s) of monitored parameter	579
Monitoring equipment	N/A
Measuring/reading/recording frequency	Continuous
Calculation method (if applicable)	The sales receipt/database is used as a reference source
QA/QC procedures	Sales Database is cross-checked with paper records to ensure transparent and robust data when applicable. $N_{y,i}$ multiplied by $R_{y,i}$ shall not exceed the maximum output of the unit [per unit].
Purpose of data/parameter	Calculation of QPW_y and capping the treated water consumed at 5.5 litres per person per day per paragraph 6 of the methodology For Case 1: $QPW_y = \Sigma(T_{y,i} x\ N_{y,I} x\ R_{y,I} x\ 365 x\ Water\ Quality_i x\ Operational\ Units_i)$
Additional comments	The value of $N_{y,i}$ is the average of number of people in the institution.

Data/Parameter	Water Quality$_i$
Unit	[proportion]
Description	Water quality measurement
Measured/calculated/ default	Measured
Source of data	Sampling surveys
Value(s) of monitored parameter	1.0
Monitoring equipment	Aquagenix water testing kit for TC (Thermotolerant Coliform) isolation was used
Measuring/reading/recording frequency	Annual or at least biennial as per the monitoring requirements in the methodology.

Calculation method (if applicable)	Water Quality testing was done on water filtered from project technology, and all of the samples came out to be free from any harmful pathogen. The pathogen so tested during monitoring is TC Coliform (Thermotolerant Strain). Water quality is defined in a relevant national standard or guidelines for drinking water quality. An indicator may be monitored to assess whether samples meet these requirements. In case a national standard / guideline for drinking water quality is not available, the "Interim or higher" performance targets as per "Evaluating household water treatment options: Health based targets and microbiological performance specifications[16]" (WHO, 2011) will be used.
QA/QC procedures	As per the World Health Organizations Guidelines[17] it is more cost-effective and feasible to monitor indicator organisms such as E.coli. Monitoring of proxies such as E. Coli, faecal coliform counts, chlorine levels may be used to assess water quality. CPA implementer shall be responsible for conducting testing. Enumerators will be trained on proper testing procedures and the appropriate testing technology will be used. CPA implementer shall be responsible for conducting testing.
Purpose of data/parameter	Eligibility criteria and Emission Reduction calculations in Equation (1.a). For Case 1: $QPW_y = \Sigma(T_{y,i} \times N_{y,I} \times R_{y,I} \times 365 \times Water\ Quality_i \times Operational\ Units_i)$
Additional comments	-

Data/Parameter	Operational Units$_i$
Unit	Percentage
Description	Percent of the monitoring period in which the units are in use
Measured/calculated/ default	calculated
Source of data	Sampling surveys
Value(s) of monitored parameter	100%
Monitoring equipment	N/A
Measuring/reading/recording frequency	At least once per verification or biennially as per the monitoring requirements in the methodology.
Calculation method (if applicable)	Monitoring surveys conducted on sample of units per technology type. The survey will then determine what percentage of days of the monitoring period the unit is in use by the end user. The mean of the percentage of operational days of the monitoring period of the samples will be applied for the parameter for each technology type.

[16] http://www.who.int/water_sanitation_health/publications/2011/evaluating_water_treatment.pdf

[17] WHO 'Guidelines for Drinking-water Quality, Fourth Edition www.who.int/**water**_sanitation_health/publications/.../dwq_**guidelines/** Page 41

QA/QC procedures	Enumerators will ensure that the unit present in the household is the same one as in the sales database by checking the unique serial number. In the case that the unique serial number is no longer visible, enumerators will inquire as to the date of purchase of the unit to ensure that the unit is not a replacement. If the specific unit selected for monitoring has been replaced it will be marked as out of use from the beginning of the monitoring period, and be deemed to be operational for 0% of the relevant monitoring period. Enumerators will be trained as to proper procedures to assess the percentage of the year which the unit is used.
Purpose of data/parameter	Emission reductions calculations Used in Equation (1.a) For Case 1: $QPW_y = \Sigma(T_{y,i} \times N_{y,I} \times R_{y,I} \times 365 \times Water\ Quality_i \times Operational\ Units_i)$
Additional comments	-

Data/Parameter	$f_{NRB,y}$
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year, y, that can be established as non-renewable biomass using national or local statistics, survey results, studies, maps or other sources of information, such as remote-sensing data.
Measured/calculated/ default	calculated
Source of data	Calculated from international reports as reference
Value(s) of monitored parameter	0.7867
Monitoring equipment	N/A
Measuring/reading/recording frequency	Continuously or at least biennial as per the monitoring requirements in the methodology.
Calculation method (if applicable)	Equations / Values MAI = F * GR — 11,667,028 R = MAI + ΔF — 19,251,028 DRB = PA * GR — 4,106,210 NRB = R - DRB — 15,144,819 **fNRB = NRB/(NRB + DRB)** — **78.67%**
QA/QC procedures	If survey is conducted, enumerators will be trained as to proper procedures to assess the baseline stove and fuel that is being or would have been used to boil water
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	As data specific to Country, regional government was not available, data from different international organization reports has been used.

Data/Parameter	η_{wb}
Unit	Fraction
Description	Efficiency of water boiling system being replaced
Measured/calculated/ default	calculated
Source of data	Default values as per AMS-III.AV combined with survey, national, or regional data to determine the percent of users using different types of water boiling systems in the baseline scenario.

<table>
<tr><td>Value(s) of monitored parameter</td><td>0.1241</td></tr>
<tr><td>Monitoring equipment</td><td>N/A</td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Continuously or at least biennial as per the monitoring requirements in the methodology.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>The type of baseline water boiling systems used by target population will be determined via survey, national, or regional data. Parameter will be determined using the following default values from AMS-III.AV:
<table>
<tr><th>Baseline Water Boiling System</th><th>Default Efficiency Value</th></tr>
<tr><td>Unimproved biomass burning stove (UBBS)</td><td>0.1</td></tr>
<tr><td>Other biomass burning stove (OBBS)</td><td>0.2</td></tr>
<tr><td>Fossil fuel stove (FFS)</td><td>0.5</td></tr>
</table>
If more than one system is encountered, a weighted average value shall be applied, calculated through formula below:

η_{wb} = [Default efficiency of UBBS] * [% of UBBS users] +
[Default efficiency of OBBS] * [% of OBBS users] +
[Default efficiency of FFS] * [% of FFS users]

For ex-ante ER calculation, data from the assumption has been used, where unimproved baseline stovesare taken as the source for boiling water in the rural and urban areas of Nigeria.:
<table>
<tr><th>Stove Type</th><th>Percent</th></tr>
<tr><td>Unimproved</td><td>87.6%[18]</td></tr>
<tr><td>Improved</td><td>8.5%[19]</td></tr>
<tr><td>Fossil fuel</td><td>3.9%[20]</td></tr>
</table>
As more than one system is encountered, a weighted average of values is applied, per calculation below:
ηwb = (0.1*87.5) + (0.2*8.5) + (0.5*3.9) = 0.1241.</td></tr>
<tr><td>QA/QC procedures</td><td>-</td></tr>
<tr><td>Purpose of data/parameter</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

Data/Parameter	$ECP_{J,j,y}$
Unit	MWh/yr
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Measured/calculated/ default	calculated
Source of data	Manufacturers' specifications, surveys, or direct monitoring

[18] http://www.ubos.org/UNHS0910/chapter9_Domestic%20Energy%20Resources.html

[19] http://www.ubos.org/UNHS0910/chapter9_Domestic%20Energy%20Resources.html

[20] http://www.ubos.org/UNHS0910/chapter9_Domestic%20Energy%20Resources.html

Value(s) of monitored parameter	0.1226 (Assuming a unit with 14 watt hour capacity being used 24 hours a day for 365 days a year)
Monitoring equipment	N/A
Measuring/reading/recording frequency	Annual or at least biennial as per the monitoring requirements in the methodology.
Calculation method (if applicable)	As per the "Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version 2. Electricity Consumption may be directly monitored or Manufacturers' specifications may be used to calculate electricity consumed by assuming that the technology is operating 24 hours a day all year or applying manufacturers' specification to user reported operation hours
QA/QC procedures	If surveys are conducted annually they will meet 90/10 confidence and precision, if they are conducted biennially they will meet 95/10 confidence and precision.
Purpose of data/parameter	Calculation of project emissions
Additional comments	To be considered only in the case the water purification device consumes electricity.

Data/Parameter	$EF_{projected\_fossilfuel}$
Unit	tCO_2/TJ
Description	Emission factor as per AMS-I.E procedures when NRB is displaced or the emission factor of the fossil fuel substituted
Measured/calculated/ default	calculated
Source of data	AMS-I.E as referenced by AMS-III.AV Version 4 for f_{NRB} and IPCC default values for fossil fuels, combined with survey, national, or regional data to determine the percent of users using woody biomass and fossil fuel(s) in the baseline scenario.
Value(s) of monitored parameter	80.86
Monitoring equipment	N/A
Measuring/reading/recording frequency	Continuously or at least biennial as per the monitoring requirements in the methodology.

<table>
<tr><td>Calculation method
(if applicable)</td><td>The type of baseline fuel used by target population will be determined via survey, national, or regional data.

Parameter will be determined using the following default values from AMS-I.E as referenced by AMS-III.AV Version 4 and IPCC:
<table>
<tr><th>Emission Factor for Baseline Fuels</th><th>Emissions Factor</th><th>Source</th></tr>
<tr><td>EF_{NRB}</td><td>81.6 tCO2/TJ</td><td>AMS-I.E</td></tr>
<tr><td>$EF_{NaturalGas}$</td><td>56.1 tCO2/TJ</td><td>IPCC</td></tr>
<tr><td>$EF_{Kerosene}$</td><td>71.9 tCO2/TJ</td><td>IPCC</td></tr>
<tr><td>EF_{LPG}</td><td>63.1 tCO2/TJ</td><td>IPCC</td></tr>
</table>
If a mixture of woody biomass and fossil fuels is used in the absence of the project activity a weighted average value shall be applied, calculated through the following formula:

$EF_{projected\_fossilfuel}$ = [EF_{NRB}]*[% of users using NRB] +
[$EF_{Natural\ Gas}$]*[% of users using Natural Gas] +
[$EF_{Kerosene}$]*[% of users using Kerosene] +
[EF_{LPG}]*[% of users using LPG]

For ex-ante ER calculation, data from UNFCCC SSC WG 37th Meeting Report (Annex 14, Para 4) has been used:
<table>
<tr><th>Stove Type</th><th>Percent</th></tr>
<tr><td>Unimproved</td><td>97.1%[21]</td></tr>
<tr><td>Improved</td><td>0.0</td></tr>
<tr><td>Fossil fuel</td><td>2.9%</td></tr>
</table>
To apply a conservative estimate of CERs, all fossil fuel used is assumed to be Natural Gas, as this fuel has the lowest emission factor. As more than one system is encountered, a weighted average of values is applied, per calculation below:
EFprojected_fossil_fuel = [81.6]*[0.971] + [56.1]*[.029] = 80.86.</td></tr>
<tr><td>QA/QC procedures</td><td>-</td></tr>
<tr><td>Purpose of data/parameter</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

Data/Parameter	Existence of public distribution network of safe drinking water
Unit	-
Description	Existence of public distribution network of safe drinking water in year *y*
Measured/calculated/ default	Measured
Source of data	Surveys and or updated credible national/local reports/letters/announcements in relation to the existence of water networks in the region
Value(s) of monitored parameter	For ex-post calculations, it is found out that there is no sufficient supply from public distribution network available for safe drinking water. If, in cases, it is present, the supply is not as per the drinking water quality standards, as tested for parameter “Case I or II”.
Monitoring equipment	N/A
Measuring/reading/recording frequency	Annual or at least biennial as per the monitoring requirements in the methodology
Calculation method (if applicable)	Review of monitoring survey or credible national/local reports/letters/announcements
QA/QC procedures	-

[21] https://tradingeconomics.com/uganda/main-cooking-fuel-wood-percent-of-households-wb-data.html

Purpose of data/parameter	Eligibility criteria
Additional comments	-

E.3. Implementation of sampling plan

>> A single sampling plan was carried out across all specific-case CPAs covered in this monitoring report.

a. List of CPAs to which the single sampling was applied

The CPA 9948 – 0002 was covered in the single sampling plan.

Total number of Institutional Filters in the project

CPA #	Filter Sales
CPA-02	1,377

b. Description of implemented single sampling design

(i) Sampling Design

The sampling plan was followed as per the applied methodology. The monitoring survey has the following sample size requirements;

Group size<300: Minimum size 30 or population size, whichever smaller
Group size 300-1000: Minimum sample size 10% of group size
Group size>1000: Minimum sample size 100.

For Institutional Water Filters – Total group size is 300-1,000 (1377 for the current Monitoring Period) and survey sample size is 89.
The parameters to be monitored have been done through a Random Sample Group (RSG). The size of the sample group is selected to ensure the parameters measured satisfy 90/10 precision (90% confidence interval and 10% margin of error), according to the methodology (page 4).

(ii) Objectives and Reliability Requirements

The objective was to obtain an unbiased and reliable estimate of the proportion or mean value of the following parameters over the course of the crediting period, and with 90/10 confidence/precision for annual/biennial sampling for applicable CPA(s).

1. Water Qualityi
2. Operational_Unitsi
3. Case1 or Case 2

Based on the registered PoA-DD and CPA-DD, 90/10 reliability level is selected for CPA specific sampling for all the parameters.

(iii) Target Population

The target population for the three parameters stated above are all Institutional Water Filters recorded in the project database.

(iv) Sampling Frame:

The target population is the Institutional Water Filters distributed and recorded, which is 1377 for the current CPA. As the paramters included for the monitoring are homologous (i.e. similar parameters), it was decided that the sampling plan would be the same for all the parameters tested.

For *Water Qualityi* and *Case I or Case II*, the test to be performed was required to be in sync with those documented in the PoA-DD & CPA-DD (checking the criteria 'Existence of public distribution network of safe drinking water' within the CPA boundary, with the help of an annual Monitoring program). The parameter tested for water quality was identification of presence & count of TC (Thermotolerant Coliform) bacteria strain, which is responsible for water borne diseases, and is a temperature resistant species to an extent. During the monitoring period, TC was tested for identification of *Operational Unitsi* parameter, as well as testing the samples of public distribution networks (to assess if they are providing safe drinking water to households, as per National drinking water standards), as the latter serves as indicator for Case I or Case II eligibility.

(v) Sampling Method

Simple Random Sampling was applied and samples was randomly selected. As the target population is quite small, compared with the CPA boundaries, and the expanse of project technology sales is restricted to a few places for now, Simple Random Sampling was sought as sampling of choice.

(vi) Sampling Size

For the estimation of the proportion or mean value of the parameters investigated, the minimum sample size for each sample frame has to achieve the 90/10 confidence/precision for annual/biennial sampling.

The sample size calculations are provided in the Project Monitoring Survey Report. The sample size came out to be 62. The actual sample size taken for the surveys is 89, taken as a measure to keep outliers into account.

c. Collected data (electronic spreadsheets may be attached and referenced)

Data was collected and survey was done by the Impact Carbon team. The team is well trained for the water quality related surveys for Impact Carbon registered projects in Uganda. The team has previously conducted such surveys for Gold Standard water filter project registered for Impact Carbon. The current survey reflects the best possible outcomes (with least possible bias and outliers) to the water quality indicators. The method of collecting data is field surveys. Surveyor visited premises, did visual inspection and had interview with project technology end-user. The data collected from the surveys were compiled into the Excel spreadsheet and has been shared with DoE.

The integrity of data is constantly cross checked, including serial numbers, sale date, number of filters purchased and end user contact information, with their original sources to ensure consistency and avoid mistakes. All original surveys and associated data are kept on file with CME.

d. Analysis of the collected data

Data obtained from the surveys were used to estimate proportions and mean values for the parameters described above. The values were then be factored into the emissions reduction calculations.

Parameter	**Result**
Water Qualityi	1.0
Operational Unitsi	100%
Leakage Factor	1.0
Case I or Case II	Case I

e. Demonstration of whether the samples were randomly selected and are representative of the population

The samples were randomly selected using Simple Random Sampling for all the project technologies. The samples selected for the identification of all the three mentioned parameters are same. Under Simple Random Sampling, the entire target population has an equal chance of being selected, thus the samples selected are deemed to be representative of population.

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

>> Emission reductions are calculated as follows:

Ex ante calculation of emission reductions expected during the crediting period for the CPA is summarized in this section. Here, example calculations are made for month – 1 (June, 2014) only, in order to provide a sample calculation for each equation used, substituting the values used in the equations.

Step 1: Calculate the quantity of purified water in year y (QPWy)

Equation (1.a)

QPW_{y1}	$QPW_y = \sum(T_{y,i} \times N_{y,I} \times R_{y,I} \times 31 \times Water\ Quality_i \times Operational\ Units_i)$
$QPW_{y1,}$	= 33 X 579 X 2.0 X 30 X 1.0 X 100% = 1,146,420 L.

Step 2: Calculate the specific energy consumption [SEC] required to boil one litre of water.

Equation (2)

SEC	$= [WH \times (T_f - T_i) + 0.01 \times WHE]/n_{wb}$
SEC	= [4.186x(100-20)+0.01x2260]/0.1241
SEC	= 2,880.58 KJ/L

Step 3: Calculate baseline emissions.

Equation (1)

BE_y	$= QPW_y \times SEC \times f_{NRB,y} \times EF_{projected\ \_\ fossilfuel} \times 10^{-9}$
BE_y	= 1,146,420 x 2,880.58 x 0.7867 x 80.86 x 10^{-9}
BE_y	= 210.07 tCO_2e/month.

F.2. Calculation of project emissions or actual net removals

>>

PE_y	$= T_y \times EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$
PE_y	= 33 x 0.1226 x 1.3 x (1 + 0.2)
PE_y	= 6.27 tCO_2e/annum, or 6.27/12 = 0.52 tCO_2e/month or PE_y = 1.0 tCO_2e/month (rounded-up PEy value).

Calculation of Project Emission Reductions:

ER_y	$= (BE_y \times L - PE_y)$
ER_y	= 210.07*0.95 – 1.0 tCO_2e/month
ER_y	= 199.56 – 1.0 = 198.56

	= 198 tCO_2e/month (rounded-down ER value).

F.3. Calculation of leakage emissions

>> Since the project monitoring included monitoring of leakage, based on the fact check that if there are any project water filters which are not used, or have been discarded/damaged in the project boundary. During the survey, it was found out that there is no single project water filter which has been left unused or discarded. Hence, the leakage factor comes out to be 100% (i.e. there is no leakage accounted for the project for the ongoing monitoring period).

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals ($t CO_2e$)	Project GHG emissions or actual net GHG removals ($t CO_2e$)	Leakage GHG emissions ($t CO_2e$)	GHG emission reductions or net anthropogenic GHG removals ($t CO_2e$)		
				Before 01/01/2013	From 01/01/2013	Total amount
9948-0002	161,940	416	8,097	0	135,064	135,064
Total	161,940	416	8,097	0	135,064	135,064

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period ($t CO_2e$)	Amount estimated ex ante ($t CO_2e$)
9948-0002	28,535	135,064
Total	**28,535**	135,064

F.6. Remarks on increase in achieved emission reductions

The emission reductions achieved in the monitoring period is lmuch more than the value estimated in ex-ante calculation. The increase in value achieved is because ex-ante calculation was based on 275 people per institution and conservative assumed values of certain parameters (e.g. *water_qualityi*, *operational_unitsi*, etc.). The project Calculation is based on the monitored parameters, which have higher value when compared with assumed ones in the Ex ante calculations. The persons served per technology comes out to be 579 during monitoring survey (which was added as 275 during Ex ante calculations), a usage rate of 100% (operational_unitsi) which was assumed to be 90% during Ex ante calculations, water quality being of higher value than assumed value during Ex ante calculations (water_qualityi = 1.0, i.e. no contaminated sample obtained from project water filter). Also, the number of filters sold during the monitoring period is higher than the sales projection for the period.

Collectively, these factors have magnified the ERs generated during the project activity to a significant extent.