Component project activity design document form

(Version 09.0)

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

BASIC INFORMATION	
Title of the CPA	Chlorine Dispensers in Uganda – CPA 9
Scale of the CPA	☐ Large-scale ☒ Small-scale
Version number of the CPA-DD	03
Completion date of the CPA-DD	15/12/2020
Title and UNFCCC reference number of the registered CDM PoA	International Water Purification Programme CDM CDM PoA 5962
Title and reference number of the corresponding generic CPA	Chlorine Dispensers in Uganda - CPA 9 5962-P1-0008-CP1
Coordinating/managing entity	Pure Water Ltd.
Host Party	Uganda
Applied methodologies and standardized baselines	AMS-III.AV. Low greenhouse gas emitting safe drinking water production systems (EB69, version 03)
Sectoral scopes	3 Energy demand
Estimated amount of annual average GHG emission reductions	59,339 tCO_2e/year

SECTION A. Description of component project activity (CPA)

A.1. Purpose and general description of CPA

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The proposed small-scale CPA consists of the distribution and installation of 1,250 chlorine dispensers ("dispensers") in Sironko District and Mbale District, Uganda.

Inadequate access to microbiologically safe drinking water continuously threatens the health and well-being of more than a billion people, primarily in developing countries. In many areas worldwide the central water infrastructure is not available at all, or not reliable, leading to unsafe water at the tap. In such cases, decentralized water treatment can be used. In Uganda, around 24% of the rural population doesn't have access to an improved water source[1] and within this CPA's project boundary 36.2% of the rural population doesn't have access to an improved water source[2].

The CPA seeks to further the access of households and communities to safe drinking water, using a low greenhouse gas emitting water purification technology, chlorine dispensers. Treating water with chlorine at the source provides an effective, low cost and safe approach to improving water quality and reducing the impact of child diarrhea in Uganda. Chlorine kills 99.99% of harmful bacteria, keeps water free from contamination for up to 72 hours, and reduces the incidence of diarrhea by approximately 40%. The CPA reduces the use and demand of non-renewable biomass that would have been used to boil the water as a mean of water purification in the absence of the CPA. This directly leads to reducing greenhouse gas emissions. This CPA is thus primarily designed for the long-term improvement of the living conditions of the local communities in this part of rural Uganda.

The CPA is a voluntary initiative undertaken by the coordinating/managing entity (CME) of the PoA, Pure Water Ltd., and implemented on a voluntary basis by Evidence Action.

The proposed CPA will deliver a long-term contribution to sustainable development in Uganda that without carbon finance would not exist:

<u>Environmental benefits</u>

- Over its lifetime, the CPA will help significantly reduce Uganda's greenhouse gas emissions.
- The CPA will help reduce the use of non-renewable biomass from Uganda's forests, assisting the maintenance of existing forest stock, protecting natural forest eco-systems and wildlife habitats.
- The protection of standing forests will ensure the maintenance of watersheds that regulate water table levels and prevent flash flooding.

<u>Social benefits</u>

- Purchasing or collecting firewood or fossil fuels to boil drinking water constitutes a significant expense for the very poorest households and communities. The CPA will provide access to safe drinking water at no cost to communities, which will reduce expenditures for families.
- Improved access to safe drinking water will reduce child and adult morbidity and mortality, can improve attendance at school, and increase productivity.
- Indoor air pollution due to open and uncontrolled combustion for boiling water is a significant health concern in Uganda. Low greenhouse gas emitting water disinfection

[1] WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation Database http://www.wssinfo.org/data-estimates/ (last retrieved 09.09.2015), 2015 Data.

[2] Ministry of Water and Environment, Republic of Uganda. Water Supply Atlas 2010

technologies such as dispensers tackle this problem by reducing the combustion of wood/fossil fuels.

- The CPA will alleviate the burden on women and children as they have to spend less time collecting firewood for boiling water. This will provide more opportunities for productive work and to attend school.

Economic benefits

- The CPA will generate short-term employment for local artisans to install dispensers, and for local people to work as survey enumerators and to deliver chlorine refills to communities.

A.2. Location of CPA

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The physical boundary of the CPA is the communities who use the water points where dispensers are installed. A database containing the GPS coordinates and unique IDs for all included chlorine dispensers is available at the Evidence Action Uganda country office.

This CPA will take place in the 2 Counties of Budadiri East and Budadiri West in Sironko District, 2 Counties of Bungokho North and Bungokho South in Mbale District, Uganda. All the dispensers are located within the Longitude: E 34.1146° – 34.4270°, Latitude: N 0.9866° – 1.2638°

The map below shows the distrubution of dispersers in the Sironko District and Mbale District, Uganda.

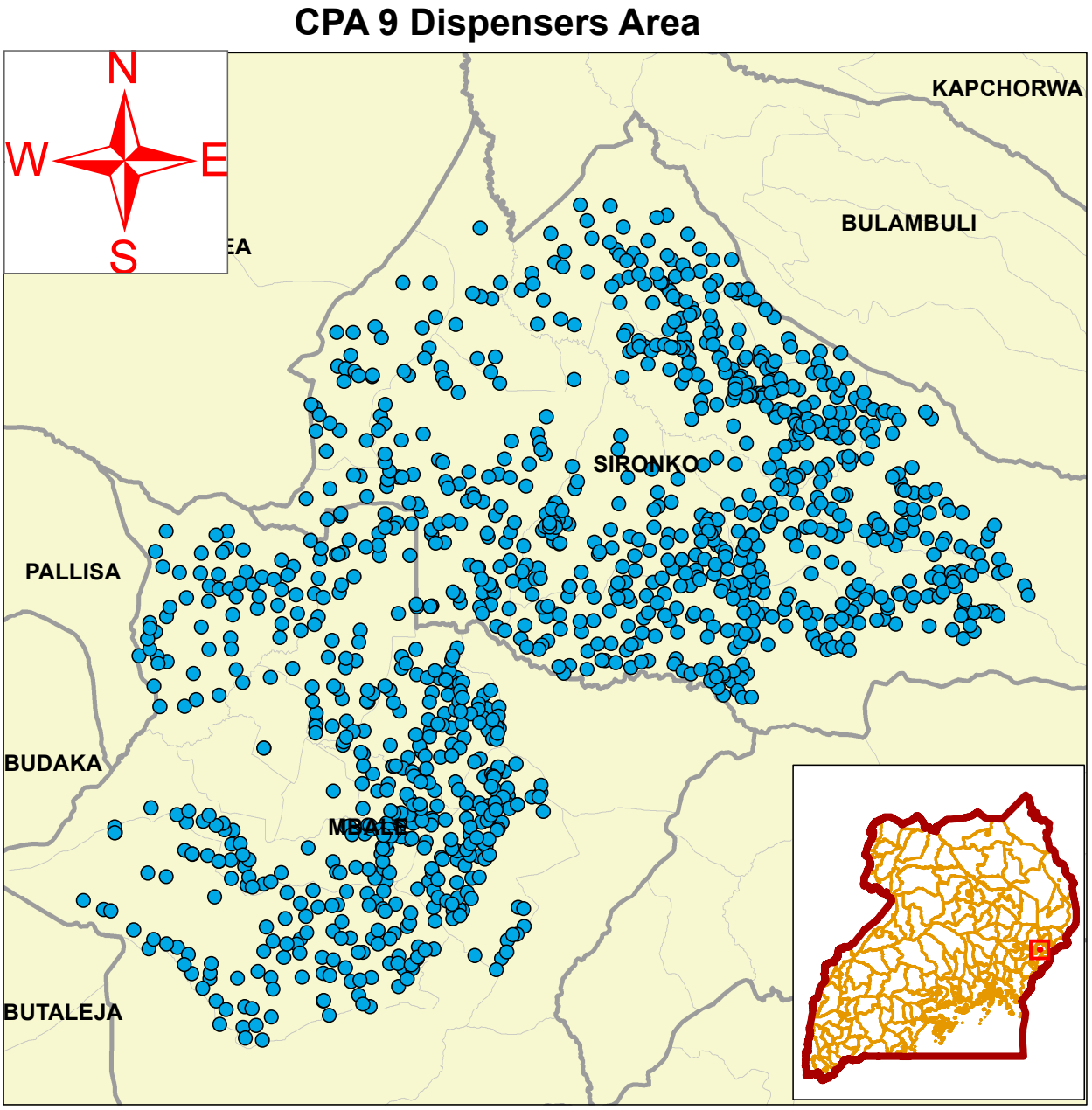

Figure 1: CPA 9 Dispensers Area

A.3. Technologies/measures

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Chlorine dispensers are an innovative, low-cost approach proven to increase rates of household water treatment. Chlorination also provides residual protection against recontamination for up to 72 hours. The chlorine dispenser program includes dispenser hardware, community education, and a regular supply of chlorine (see Figure 2). To use the dispenser, community members go to their water source, place their bucket or jerrican under the dispenser, turn the valve to dispense the correct amount of chlorine, and then fill the bucket as they normally would with water from the source and wait for 30 minutes before using the water. Based on the results of the turbidity measurements during the Water Point Verification the community is informed to turn the valve either once (3 ml) or twice (6 ml).[3] Evidence Action educates the community about the dangers of contaminated water and how to use the dispenser to treat their water. A community member

[3] In case turbidity levels in the drinking water exceed 10 NTU a doubled chlorine dose of 6 ml is required.

volunteers to be the dispenser 'promoter or assistant promoter', who encourages use of the dispenser, reports any problems, and refills the dispenser with chlorine. Evidence Action provides on-going servicing of the dispensers such that communities have sustainable access to safe water over the long-term.

In the absence of the CPA, the local households would have been used to boil the water as a mean of water purification to get daily safe drinking water, which is a continuation of current practice. Treating water with chlorine at the source by the CPA provides an effective, low cost and safe approach to improving water quality and reducing the impact of child diarrhea in Uganda. Chlorine kills 99.99% of harmful bacteria, keeps water free from contamination for up to 72 hours, and reduces the incidence of diarrhea by approximately 40%.

Figure 2: Chlorine dispenser system

Hardware specification	
Dispenser casing	Injection-molded HDPE tank produced in Kenya
Dispenser tank	Blow-molded HDPE tank produced in Kenya; capacity 3 liters
Dispenser tank valve	Imported from USA; delivers a precise 3 ml dose of chlorine
Marine padlock	Imported from China
Asset tag	Imported from USA
Chlorine	Sodium hypochlorite solution, 11.90 minimum pH, 1.2% ± 0.1 available chlorine; imported from Kenya in 5 liter container with tamper-resistant cap
Hardware lifetime	5 years
Service capacity	28'800 L per day[4]
Manufacturer	Blowplast LTD

The following operational procedure is followed:

1. **Program area selection**: the installation areas have been selected due to their high prevalence of cholera cases, child mortality, high diarrhea rates, and very low coverage of treated piped water.

[4] Assuming 30 seconds per dispensing over 12 hours per day

2. **Collaboration with officials**: in Uganda, Evidence Action works very closely with the Ministry of Health. Most of the field activities, e.g. water source selection, village community sensitization and community education meetings, are performed by Health Surveillance Assistants (HSAs) who are trained by Evidence Action.
3. **Water source selection**: meetings are held with local officials to obtain a list of water points in the area. A water point verification is conducted to identify suitable water points for dispenser installation, incl. turbidity measurements. Each water point a unique ID is given.
4. **Village community sensitization**: the project is introduced to end users, the water points selected for dispenser installation are communicated, and the community decides and votes on whether they want to have a dispenser installed.
5. **Dispenser installation**: dispenser installations are conducted by local artisans trained and managed by Evidence Action. Each dispenser casing is marked with a unique identification number on a scannable asset tag (barcode). The allocation of this unique barcode ID to the unique water point ID is recorded in a central database.
6. **Community education meeting**: community members learn about the dangers of contaminated drinking water, how to use the dispenser properly, and the local dispenser 'promoter' and 'assistant promoter' is chosen by the community. In presence of all attendants a carbon right waiver is signed at the Community Education Meeting by the promoter.
7. **Ongoing maintenance and refilling**: Evidence Action provides maintenance of the dispenser hardware to ensure that the dispenser is always available for use. The HSAs are responsible for delivering the chlorine to the promoters. Each time a dispenser is being replaced, the barcode ID is updated in the central dispenser database.

A.4. Coordinating/managing entity

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Pure Water Ltd.

A.5. Parties and CPA implementers

Parties involved	CPA implementers	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Uganda (host)	Evidence Action (CPA implementer)	Yes
Switzerland	Pure Water Ltd. (CME)	No
Switzerland	Swiss Carbon Assets Ltd.	No
Switzerland	Climate Cent Foundation	No

A.6. Public funding of CPA

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Evidence Action has received financial assistance from the Development Innovation Ventures (DIV) fund of the United States Agency for International Development (USAID). This funding does not result in diversion of Official Development Assistance (ODA) and is not counted towards the financial obligations of the United States.

A.7. History of CPA

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The following timeline will be followed:

Date	Event
29th July 2011	Validation start date of IWPP (PoA)

14th February 2012	50 pilot dispensers installed in Kibuku district - not included in IWPP) (February 2012 – August 2012)
February 2012 onwards	Regular supply of chlorine solution and replacements of chlorine dispensers as needed.
16th November 2012	Registration of the PoA under the CDM of the UNFCCC.
9th October 2013	Emission Reduction Purchase Agreement signed between Pure Water Ltd. (the CME) and Evidence Action (implementer).
7th November 2013	Local Stakeholder Consultation conducted
3rd August 2014	Start date of CPA 9: installation of the first dispenser (in Sironko district, Bukiise sub-county). The unique barcode ID of the dispenser is 1016594.
August 2014 – November 2014	Installation of 1,209 chlorine dispensers in the Sironko and Mbale districts in Eastern Uganda as part of CPA 9
December 2014 to December 2017	Installation of additional 41 chlorine dispensers in the Sironko and Mbale districts, Uganda. 1) Site inspection of all water points in a district and identification of suitable water points for chlorine dispenser installation. 2) Village community sensitization meeting: the end users decide whether or not they want to have a chlorine dispenser. 3) Installation of chlorine dispenser by local artisans. 4) Community education meeting: the end users are trained on water, sanitation and hygiene issues and a promoter is elected by the end users.
August 2014 onwards	Regular supply of chlorine solution and replacements of chlorine dispensers as needed.
	Distribution of the devices according to the following schedule:

Year	Number of installed devices
2015	1,209
2016	1,209
2017	1,250
2018	1,250
2019	1,250
2020	1,250
2021	1,250
2022	1,250

A.8. Debundling

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According to the Methodological tool "Assessment of debundling for small-scale project activities, v04.0 (EB 83, Annex 13, Para. 17) for determining the occurrence of de-bundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is not larger than 1% of the small scale threshold defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity.

The small-scale threshold defined by the methodology applied, AMS-III.AV version 03, is the annual emissions reductions 60,000 tCO_2e/y. Thus, 1% corresponds to annual emissions reductions of 600 tCO_2e/y.

For this CPA, the emissions reductions per appliance (see section B.4.4.on emission reductions) are equal to 50.2 tCO_2/yr. Since this value is below the threshold of 600 tCO_2e/y, this CPA is therefore not a debundled component of a large-scale activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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AMS-III.AV. Low greenhouse gas emitting safe drinking water production systems
(EB69, version 03)

This methodology refers to the following methodology and tools:

- AMS-I.E. Switch from Non-Renewable biomass for thermal applications by the user (version 5)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 2)
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1)

B.2. Project boundary, sources and greenhouse gases (GHGs)

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As defined in the methodology: the project boundary includes the physical, geographical sites of the low greenhouse gas emitting technologies for water purification installed by the project activity at the household/institutional buildings where the consumers of safe water provided by the system are located.

For this project activity, the project boundary includes the physical, geographical sites of 1,250 chlorine dispensers for water purification installed by the project activity in the Sironko District and Mbale District, Uganda and the household where the consumers of safe water provided by those 1,250 chlorine dispensers are located.

The sources and gases included in the SSC-CPA boundary are shown in the table below:

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from fossil fuels/ Non Renewable biomass utilized for obtaining safe drinking water by boiling displace due to project activity.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	CO_2 emissions from consumption of fossil fuels and/or electricity for the operation of the project activity.	CO_2	No	Minor emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Leakage	CO_2 emissions from consumption of non-renewable woody biomass by non-project households/users that previously used renewable energy source.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source

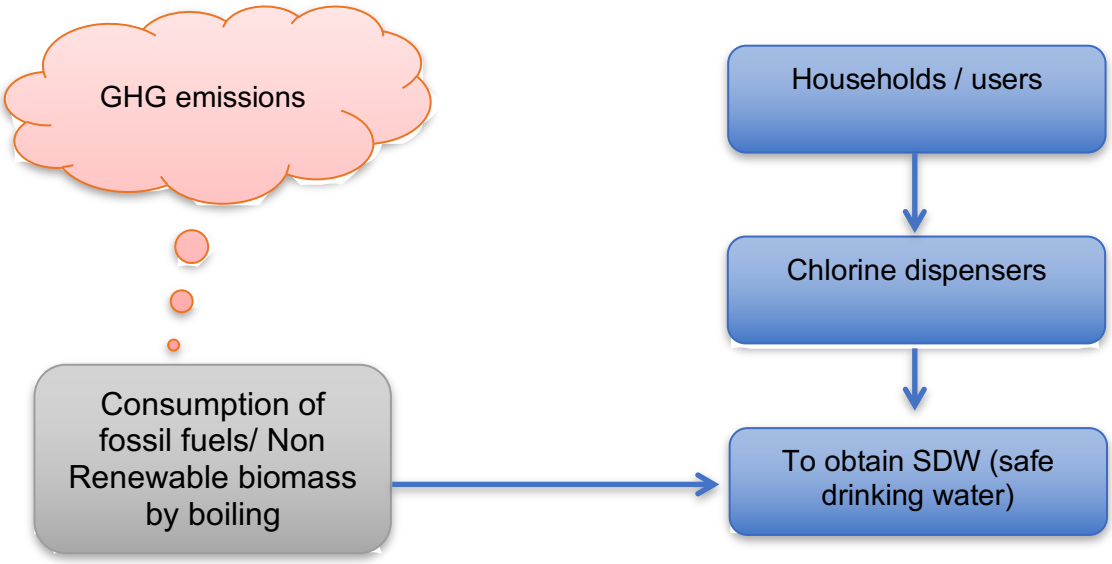

Figure 3: Flow diagram showing the equipment and emission sources include in the boundary

B.3. Establishment and description of baseline scenario

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According to the applied methodology, for a simplified and standardized approach it is assumed that fossil fuel or non-renewable biomass (NRB) is used to boil water as a mean of water purification in the absence of the project activity. Therefore the baseline scenario is the use of fossil fuel or NRB to boil water.

In early 2016 a baseline survey was conducted to determine the type of stoves and fuel used. The weighted average of the stove efficiency was used for calculating the baseline emissions as more than one type of stove/fuel is used in the project area.

Key parameters for the baseline determination are shown in section B.4.3. and Appendix 3.

B.4. Estimation of emission reductions

B.4.1. Explanation of methodological choices

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The small scale methodology AMS-III.AV requires methodological choices to be made as follows:

Paragraph 3: Determination of Case 1 or Case 2

1) Case 1: 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 % confirmed by 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 an university;

(iii) Using survey methods (use 90/10 confidence/precision for sampling)

(b) Case 2: Project activities implemented in areas not included in Case 1.

In this CPA-DD official data from the Water Supply Atlas 2010 from the Ugandan Ministry of Water and Environment [5](government agency) are used as these data provide the most recent data available disaggregated at the district-level (confirmed per email by ATC Wash on April 16, 2014).

The population-weighted average access to an improved water source in the project area is 63.8% (details provided in the ER calculation sheet) and therefore the CPA will follow the **Case 2** requirements.

Paragraph 6. Quantity of purified water (cap)

QPW_y *Quantity of purified water in year y (litres)*

The quantity of purified water is the total amount of water treated by the project activity in year y. It should be directly monitored; alternatively, it should be based on (a) the population serviced by the project equipment, estimated using surveys and (b) an average volume of drinking water per person per day estimated using surveys or official data or peer reviewed literature or local expert opinion (a value of 5.5 litres per person per day shall not be exceeded)

In this CPA the population serviced by the project equipment was estimated using survey and the volume of drinking water per person per day was obtained from official data of the World Health Organization.

Paragraph 7. Determination of the efficiency of the water boiling systems being replaced I

[5] Ministry of Water and Environment, Republic of Uganda, Water Supply Atlas 2010 http://www.mwe.go.ug/index.php?option=com_docman&task=cat_view&gid=12&Itemid=223

η_{wb} *Efficiency of the water boiling systems being replaced*

Use one of the options below:

1. *The efficiency of the water boiling system shall be established using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of systems are encountered;*
2. *0.10 default value may be optionally used if the replaced system or the system that would have been used is a three stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system i.e. without a grate as well as a chimney; for the rest of the systems using woody biomass 0.2 default value may be optionally used. Use weighted average values if more than one type of systems are encountered 0.5 default value may be used if the replaced system or the system that would have been used is a fossil fuel combusting system*

In this CPA Option 2 is used (see Appendix 3).

Paragraph 7. Determination of the efficiency of the water boiling systems being replaced II

T_i Initial temperature of water (°C)

Use annual Average ambient temperature; or

Use a default value of 20 °C

In this CPA the default value of 20 °C will be used.

Paragraph 11. Determination of the quantity of purified water

QPW_y *The quantity of purified water in year y shall be monitored as per the following options:*

(a) *On continuous basis or a representative sample thereof;*

(b) *Derived from the capacity of the equipment established by manufacturers' specifications and the number of functional project appliances as per paragraph 10.*

In this CPA Option b is used (section B.4.3).

B.4.2. Data and parameters fixed ex ante

(Copy this table for each piece of data or parameter.)

Data and ex-ante parameters are as follows:

Data / Parameter	**$EF_{projected\_fossilfuel}$**
Data 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
Source of data	AMS-I.E for NRB displacement, IPCC for other fossil fuel displaced
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	As per AMS-I.E, this value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis.
Purpose of data	Conversion of energy demand for boiling water (TJ) to carbon dioxide emissions (tCO_2). Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	WH
Data unit	kJ/L ˚C
Description	Specific heat of water
Source of data	AMS-III.AV version 03
Value(s) applied	4.186
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	T_f
Data unit	˚C
Description	Final temperature
Source of data	AMS-III.AV version 03
Value(s) applied	100
Choice of data or Measurement methods and procedures	Default value. Boiling point of water at standard conditions.
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	T_i
Data unit	˚C
Description	Initial temperature
Source of data	AMS-III.AV version 03
Value(s) applied	20
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	WHE
Data unit	kJ/L
Description	Latent heat of water evaporation
Source of data	AMS-III.AV version 03
Value(s) applied	2,260
Choice of data or Measurement methods and procedures	Default value. The latent heat required to boil one liter of water for five minutes is assumed to be equivalent to latent heat for the evaporation of 1% of the water volume (WHO recommends a minimum duration of five minutes of water boiling)[6]

[6] WHO guidelines for Emergency Treatment of drinking water at point of the use www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf

Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	η_{wb}
Data unit	-
Description	Efficiency of the water boiling system being replaced
Source of data	Baseline survey
Value(s) applied	10.65 %
Choice of data or Measurement methods and procedures	The prevalence of different cook stove types in the project area was determined in the baseline survey (see Appendix 3). 0.10 default value is used if the replaced system or the system that would have been used is a three stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system i.e. without a grate as well as a chimney; for the rest of the systems using woody biomass 0.2 default value is used.
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	The water boiling systems and the fuel used in the baseline have been established ex-ante via a baseline survey.

Data / Parameter	f_{NRB}
Data unit	-
Description	Non Renewable Biomass factor
Source of data	EB 67 Report Annex 22
Value(s) applied	82 %
Choice of data or Measurement methods and procedures	Fraction of woody biomass used in the absence of the project activity in year y for Uganda as per “Information note: Default values of fraction of non-renewable biomass for least developed countries and small island developing states (version 01.0)”
Purpose of data	Adjustment factor for baseline emission calculation. Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	L_P
Data unit	Liters/refill (chemical disinfection)
Description	Capacity of the water purification equipment
Source of data	Manufacturer’s specifications / Water Point Verification
Value(s) applied	33,115 L
Choice of data or Measurement methods and procedures	Manufacturer specifications of maximal amount of water treated based on one refill (5 liter chlorine solution) and dosage (3 ml dose treats 20 liters of water if turbidity is below 10 NTU and 6 ml if turbidity is above 10 NTU) The results of the Water Point Verification show that 99.34% of the households in the project boundary collect water from dispensers with 3 ml dosage and 0.66% from dispensers with 6 ml dosage, and thus the weighted average per dosage is 3.020 ml. L_P = (5,000 ml/3.020 ml) * 20 L = 33,115 L

Purpose of data	Used to monitor the quantity of purified drinking water together with the number of functional project appliances. L_P needs to be multiplied by the average number of refills per functional dispenser and year (Refill#), monitored as specified in section B.5.1. Required for calculation of baseline emissions.
Additional comment	For the sake of conservativeness the specifications are adjusted for chlorine losses during refills (Refill%) and chlorinated water used for other purposes than drinking (Drink%), monitored as specified in section B.5.1.

Data / Parameter	**POP_P**
Data unit	Person
Description	Number of persons supplied with purified water from each of the functional project appliances
Source of data	Water Point Verification
Value(s) applied	243
Choice of data or Measurement methods and procedures	As part of the Water Point Verification conducted by Evidence Action prior to the dispenser installation, the number of households using each water points was established at 43.4 households per dispenser. POP_P = 43.4 households * 5.6 people/household[7] = 243 (rounddown)
Purpose of data	Used to calculate the cap of purified drinking water consumed for drinking purposes according to paragraph 6 in AMS-III.AV version 03. Required for calculation of baseline emissions.
Additional comment	The project activity falls under Case 2 per paragraph 3(a) in AMS-III.AV version 03, therefore this parameter needs to be re-established at least every two years. The applied value is rounded to the closest integer.

Data / Parameter	**DW_{POP}**
Data unit	Liters/person/day
Description	Average volume of drinking water per person per day
Source of data	Official data, WHO, minimum water quantity needed
Value(s) applied	3.5
Choice of data or Measurement methods and procedures	Official data used on average volumes of drinking water per person per day in emergency situation published by World Health Organization.[8] Conservative value as according to AMS-III.AV Version 03 a value of 5.5 liters per person per day shall not be exceeded.
Purpose of data	Used to calculate the cap of purified drinking water consumed for drinking purposes according to paragraph 6 in AMS-III.AV version 03. Required for calculation of baseline emissions.
Additional comment	-

Data / Parameter	**$POP_{Boiling}$**
Data unit	-
Description	Proportion of total population attended by the project that is serviced at households/buildings where water boiling would have been the purification practice.
Source of data	Baseline Survey

[7] Uganda Household Survey 2009/2010, average household size for Eastern Uganda

[8] WHO SEARO, Minimum water quantity needed for domestic uses, 3 – 4 liters per person per day http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WHO/WHO5%20-%20Minimum%20water%20quantity%20needed%20for%20domestic%20use.pdf

Value(s) applied	85.90%
Choice of data or Measurement methods and procedures	Survey
Purpose of data	Adjustment factor applied to the cap of the quantity of purified water
Additional comment	For Case 2, total project population needs to be adjusted for the fraction of the population serviced by the project equipment at households/buildings for which it can be demonstrated through documentation or survey that the practice of water purification would have been water boiling.

Data / Parameter	**Ex-ante determined parameters for the project emissions from fossil fuel combustion**
Data unit	-
Description	Parameters to be determined ex ante for the calculation of project emissions from fossil fuel combustion as per the tool
Source of data	-
Value(s) applied	No consumption of fossil fuel by chlorine dispensers
Choice of data or Measurement methods and procedures	-
Purpose of data	Used to quantify the project emissions.
Additional comment	To be considered only in the case the water purification device consumes fossil fuel.

Data / Parameter	**Ex-ante determined parameters for the project emissions from electricity consumption**
Data unit	-
Description	Parameters to be determined ex ante for the calculation of project emissions from electricity consumption as per the tool
Source of data	-
Value(s) applied	No consumption of electricity by chlorine dispensers
Choice of data or Measurement methods and procedures	-
Purpose of data	Used to quantify the project emissions.
Additional comment	To be considered only in the case the water purification device consumes electricity

Data / Parameter	**Leakage**
Data unit	-
Description	Fractional increase in NRB usage by households outside the project boundary
Source of data	AMS-I.E Version 5
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	Leakage related to the non-renewable woody biomass saved by the project activity will be assessed based on a net to gross adjustment factor of 0.95 to account for leakages. In this case surveys are not required. This is in line with the provisions in AMS-I.E Version 05.0.
Purpose of data	Calculation of leakage
Additional comment	-

B.4.3. Ex ante calculation of emission reductions

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1. Baseline emissions

The baseline emissions shall be calculated as follows, according to AMS.III-AV version 03:

$$\mathrm{BE}_{\mathrm{y}} = QPW_y * \mathrm{SEC} * f_{NRB,y} * EF_{projected\_fossilfuel} * 10^{-9} \quad \textbf{(1)}$$

Where:

BE_y	Baseline emissions during the year *y* (tCO_2e)
QPW_y	Quantity of purified water in year *y* (liters), see below
SEC	Specific energy consumption required to boil one liter of water (kJ/L), see below
$f_{NRB,y}$	Fraction of non-renewable biomass, see below
$EF_{projected\_fossilfuel}$	Emission factor, a default value of 81.6 tCO_2/TJ is used

a) Water quality

The water quality shall be monitored on sample basis for contamination with Escherichia coli (E. coli). A presence/absence test for E. coli colony forming units (CFU) in 10 ml of water or an equivalent quantitative test for E. coli CFU shall be used. A presence of up to 10 E. coli CFU/100 ml shall be acceptable. The fraction of water quality measurements providing water of insufficient quality shall be excluded from the calculation of emission reductions.

To be conservative, it is estimated that 90% of all chlorine dispensers comply with this quality threshold (Correction $\text{Factor}_{\text{water quality}}$ = 90%).

b) Quantity of purified water, QPW_y

The total amount is subject to a cap derived from the population serviced by the project equipment POP_P multiplied by the average volume of drinking water per person per day based on official data. The average volume of drinking water is set at 3.5 liters per person per day and each dispenser is expected to service 243 people. It is estimated that there will be 1,250 chlorine dispensers to be installed for the project activity and 95% of all chlorine dispensers will be functional at the end of each monitoring period. In addition, $POP_{Boiling}$, which is 85.90%, is applied.

Therefore, the Cap on quantity of purified water is calculated as follows:

$QPW_{y,cap}$ = N_y * POP_P * $POP_{Boiling}$ * DW_{POP} * 365

= (1,250 * 95%) * 243 * 85.90% * 3.5 L * 365

= 316,660,552 L/year

$QPW_{y,cap}$: Cap on quantity of purified water in year y

This CPA falls into Case 2 (more than 60% of the CPA population is using an improved drinking water source). The quantity of purified water is determined based on the number of chlorine

dispensers installed that will be functional during the crediting period, and the estimated volume of drinking water that can be treated by each functional chlorine dispenser (based on average number of chlorine refills multiplied by the dispenser capacity and by two correction factors accounting for chlorine losses during dispenser refilling and treated water that is used for purposes other than drinking). The relevant estimates from the baseline survey and dispenser database are as follows for the ex-ante calculation:

- Average dosage = 3.020 ml;
- Average number of refills per functional dispenser per year (Refill#) = 9.2;
- Fraction of delivered chlorine available for use in dispenser (Refill%) = 95%
- Fraction of water treated with the dispenser that is actually drunk (Drink%) = 90%
- L_P = 5 L / average dosage * 20 L = 5 L / 3.020 ml * 20 L = 33,115 L

$QPW_{y, sample}$ = L_P * N_y * Refill# * Refill% * Drink%

= 33,115 L * (1,250 * 95%) * 9.2 * 95% * 90%

= 310,466,226 L /year

$QPW_{y, sample}$: Sampled quantity of purified water in year y

To be conservative, the lower value between $QPW_{y, sample}$ and $QPW_{y, cap}$ is taken as the value of QPW_y. Therefore, QPW_y = min ($QPW_{y,cap}$,$QPW_{y,sample}$) = 310,466,226 L/year

c) Specific energy consumption, SEC

Specific energy consumption required to boil one liter of water is to be calculated as follows:

$$SEC = \left[WH * (T_f - T_i) + 0.01 * WHE \right] / n_{wb} \quad \textbf{(2)}$$

Where:

WH Specific heat of water, a default value of 4.186 kJ/L °C is used

T_f Final temperature, a default value of 100 °C is used

T_i Initial temperature of water, a default value of 20 °C is used

WHE Latent heat of water evaporation, a default value of 2,260 kJ/L is used

η_{wb} Efficiency of the water boiling systems being replaced, see below

According to the ex-ante survey conducted, the water boiling systems that are replaced are mostly three stone fire systems and the biomass used is wood. Therefore, an efficiency of 10.65% is used. Please refer to Appendix 3.

Therefore SEC = 3,357 kJ/L

d) Establishment of the Non Renewable Biomass factor, f_{NRB}

Project participants may use applicable default values, detailed formulas or approved tools provided by the UNFCCC to establish f_{NRB}, if available at the time of CPA inclusion.

The fraction of woody biomass used in the absence of the project activity is taken from the information note of the EB 67 Report Annex 22: "Default values of fraction of non-renewable biomass for least developed countries and small island developing states (version 01.0)"

A value of 82% is used for Uganda.

e) Determination of emission factors ($EF_{projected\_fossilfuel}$)

The emission factor as per AMS-I.E procedures is taking the default value as 81.6 tCO_2 /TJ.

f) Fraction of water quality test

Correction factor water quality with < 10 CFU/100 ml is estimated as 90%

Therefore the annual baseline emission is calculated as follows:

$BE_y = QPW_y * SEC * f_{NRB,y} * EF_{projected\_fossilfuel} * 10^{-9}$ * Correction $Factor_{water\ quality}$

= 310,466,226 L/year * 3,357 kJ/L * 82% * 81.6 tCO_2/TJ * 10^{-9} * 90%

= 62,757 tCO_2/Year

2. Project emissions

If the operation of the project water purification system involves consumption of fossil fuels and/or electricity, project emissions include:

1. CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";
2. CO_2 emissions from electricity consumption by the project activity using the latest version of the tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

The operation of the chlorine dispensers does not involve the consumption of fossil fuels or electricity.

Therefore, the project emissions are zero.

3. Leakage emissions

Leakage relating to the non-renewable woody biomass is assessed as per the relevant procedures of AMS-I.E version 5 explained below:

BE_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. Therefore, the leakage is calculated as follows:

Leakage = BE_y * (1 – 95%)

= 62,757 tCO_2/year * (1 – 95%)

= 3,138 tCO_2/year

B.4.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	60,698[9]	0	3,035	45,985
Year 2	62,757	0	3,138	59,619
Year 3	62,757	0	3,138	59,619
Year 4	62,757	0	3,138	59,619
Year 5	62,757	0	3,138	59,619
Year 6	62,757	0	3,138	59,619
Year 7	62,757	0	3,138	59,619
Total	**437,240**	**0**	**21,863**	**415,377**
Total number of crediting years	7			
Annual average over the crediting period	62,463	0	3,123	59,339

B.5. Monitoring plan

B.5.1. Data and parameters to be monitored

(Copy this table for each piece of data or parameter.)

Based on AMS-III.AV version 03, following data will be monitored during the project crediting period:

Data / Parameter	**QPW_y**
Data unit	Liters
Description	Quantity of purified water in year y
Source of data	Value derived from the capacity of the equipment and the number of functional project appliances.
Value(s) applied	310,466,226
Measurement methods and procedures	Derived from the capacity of the equipment established by the manufacturers' specifications, the number of functional project appliances, average number of refills per dispenser and two adjustment factors: $QPW_{y,\ sample} = L_P * N_y * Refill\# * Refill\% * Drink\%$ Refill#: Average number of refills per functional dispenser per year Refill%: Fraction of delivered chlorine available for use in dispenser Drink%: Fraction of water treated with the dispenser that is actually drunk $QPW_{y,cap} = N_y * POP_P * DW_{POP} * POP_{Boiling} * 365$ days In order for conservative calculation, the lower value between $QPW_{y,\ sample}$ and $QPW_{y,\ cap}$ Is taken as the value of QPW_y

[9] For the 1st year of crediting period, there is only 1,209 dispenses installed for operation and another 41 dispensers will be in place for operation since the 2nd year of crediting period. It is estimated that annual baseline emission by the project activity is 62,757 tCO_2e at its full capacity (i.e. a total of 1,250 dispensers is put into operation). Therefore, for the 1st year of crediting period, the estimated emission reduction is 60, 698 tCO_2e (i.e. = 62,757 /1,250 * 1,209 = 60,698 tCO_2e).

Monitoring frequency	Annual (Refill#, Refill% and Drink% are monitored at least annually.)
QA/QC procedures	The date of installation/distribution of a device shall be considered in the calculation of the emission reductions. In case a device is found to be non-functioning, it shall be deducted from the emission reductions for the whole monitoring period or from the date it broke down if this date is recorded.
Purpose of data	Used to calculate the baseline emissions.
Additional comment	N/A

Data / Parameter	**N_y**
Data unit	-
Description	Number of functional chlorine dispensers in year y
Source of data	Periodical physical inspection of each device (spot-checks)
Value(s) applied	1,187.5 (= 1,250 * 95% = 1,187.5, as it is assumed that 95% of the chlorine dispensers are operational)
Measurement methods and procedures	The number of functional appliances (dispensers) will be determined at least once a year for each group of CPAs (based on the functionality records in the dispenser database).
Monitoring frequency	Annual
QA/QC procedures	In case a chlorine dispenser is not operating and has not been replaced, it will be excluded from the emission reduction calculation for the whole monitoring period considered, unless evidence of the date it broke down can be provided. The start date of each device, i.e. date of installation/distribution, will be considered to calculate the total amount of water purified during the year. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Used to calculate the quantity of purified water QPW_y (see above). Required for calculation of baseline emissions.
Additional comment	The PoA-DD indicates sampling, however, monitoring of all dispensers is proposed as this is more accurate.

Data / Parameter	**Existence of public distribution network supplying safe drinking water**
Data unit	-
Description	Existence of public distribution network supplying safe drinking water to the project boundary in year y
Source of data	Interview with Local Resident District Commissioner (RDC)
Value(s) applied	0
Measurement methods and procedures	In case a safe drinking water network is found to exist, households receiving SDW will be identified via map, surveys, and/or pictures.
Monitoring frequency	Annual
QA/QC procedures	Emission reductions related to those households will be discounted accordingly considering the number of households linked to the network and the date the network became operational.
Purpose of data	Adjustment factor for baseline emission calculation
Additional comment	N/A

Data / Parameter	**POP_y**
Data unit	-
Description	Number of persons supplied with purified water from each of the functional project appliances

Source of data	-
Value(s) applied	243
Measurement methods and procedures	For project activities falling under Case 2 per paragraph 3 (b), The number of persons supplied with purified water from each of the functional project appliances will be re-established for all devices annually.
Monitoring frequency	Annual.
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Calculation of baseline emissions
Additional comment	Relevant because this CPA falls under Case 2

Data / Parameter	**Water quality**
Data unit	-
Description	Water quality
Source of data	Sampling surveys
Value(s) applied	90%
Measurement methods and procedures	Total Chlorine Residual (TCR) is used to identify water that has been chlorinated. All household stored water samples that test positive for TCR are then tested for E.coli. The fraction of households with sufficient water quality is established for a CPA or a group of CPAs as number of samples with E.coli below 10 CFU/100 ml divided by the number of samples that tested positive for the presence of TCR.
Monitoring frequency	Annual
QA/QC procedures	The fraction of water quality measurements providing water of insufficient quality shall be excluded from the calculation of emission reductions.
Purpose of data	Adjustment factor for baseline emission calculation
Additional comment	N/A

Data / Parameter	**Monitoring parameters for the project emissions from fossil fuel combustion**
Data unit	-
Description	Parameters to be monitored for the calculation of project emissions from fossil fuel combustion as per the tool
Source of data	-
Value(s) applied	No consumption of fuel by chlorine dispensers
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Used to quantify the project emissions
Additional comment	To be considered only in the case the water purification device consumes fossil fuel.

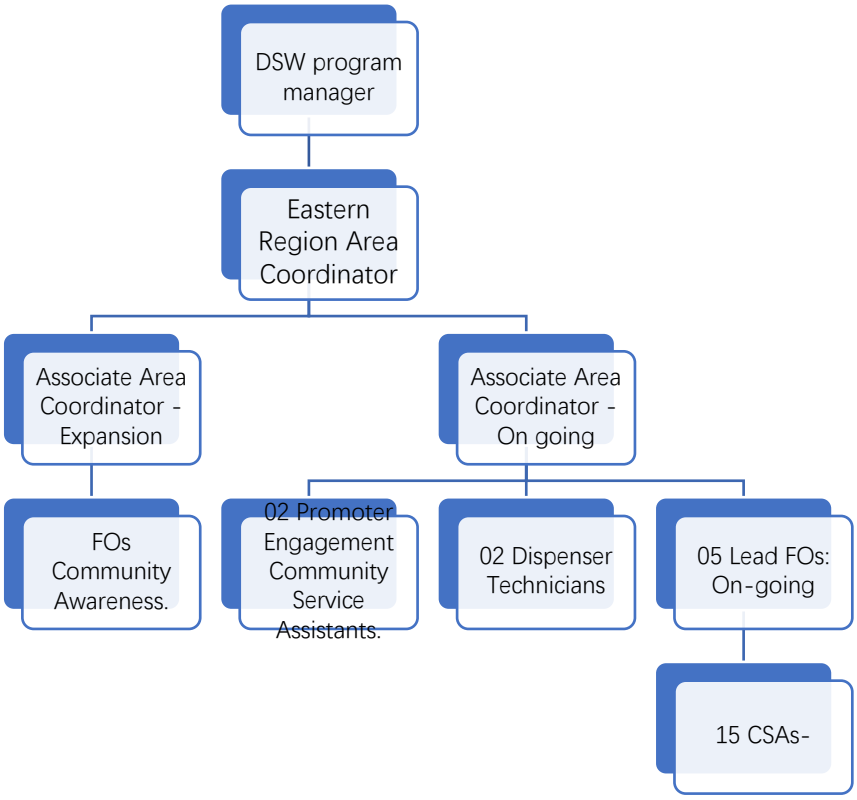
Data / Parameter	**Monitoring parameters for the project emissions from electricity consumption**
Data unit	-
Description	Parameters to be monitored for the calculation of project emissions from electricity consumption as per the tool
Source of data	-

Value(s) applied	No consumption of electricity by chlorine dispensers
Measurement methods and procedures	-
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Used to quantify the project emissions
Additional comment	To be considered only in the case the water purification device consumes electricity.

B.5.2. Sampling plan

>>

It is the responsibility of Evidence Action to monitor and record all parameters included in section B.5.1, under the guidance of the CME. The organization structure of Evidence Action for the project is shown below:



Program Manager: *The role of the Progam Manager is to provide general oversight and leadership to the program teams to deliver an impactful and cost-effective program following the organizational standard operating practices, policies and guidelines and following project design documents. Specifically this role broadly ensures that the whole outfit of Dispensers for Safe Water meets the desired program targets to deliver the objective of serving more that 1.8 million people with safe water perpetually through an effective service delivery process.*

Area coordinator: *Leads operations of Dispensers for Safe Water in a region/location which covers approximately 6000 dispensers. Coordinates, the planning and impementation of the 5 best practices of Dispensers for Safe Water and the ongoing circuit rider, communty/stakeholder engagement and adoption management activities. Additionally, provides supervision over the entire team in the region to ensure that they perform according the set targets of the organization.*

Associate Area Coordinator*: Associate area coordnator provides leadership over activities and teams that implement them in a specific department in Dispensers for Safe Water. In Uganda we have 02 departments i.e On-going and Expansion.*

Lead Field Officers*: Lead field officers provide supervision over the implementation of the circuit rider model and beneficiary/stakeholder engagement for areas covering atleast 1000 dispenser or a field office. They also supervise CSAs who cover the respective dispensers in that location.*

Field Officers*: They undertake the community facing engagements that are put in place to create general awareness of Dispensers for Safe Water amongst grass root communities.*

Dispenser Technicians*: These undertake the repair of dispensers that have functionality problems.*

Circuit rider community service assistants*: They make calls to promoters to encourage them/motivate them to undertake their role with vigour.*

Promoter engagement community service assistants*: They deliver chlorine to promoters and carry out promoter engagement through the circuit rider model.*

The monitoring is done as per the requirement of AMS-III.AV Version 3 and the Standard for sampling and surveys for CDM project activities and programme of activities Version 03.0 and is described below:

Parameters to be monitored for each CPA

The following table gives an overview of the parameters to be monitored for *each* CPA:

Parameter	Means of monitoring	Monitoring frequency
Existence of public distribution network supplying safe drinking water	Interview with an official at the Local Resident District Commissioner (RDC) to determine if a piped water supply exists for the sub-counties included in the CPA. In the event that the RDC mentions that a public distribution network has become available within the project boundary, measures will be undertaken to determine the number of households supplied by the public system.	Annual

Parameters to be sampled for each CPA individually, or for groups of CPAs to which this CPA belongs

The following table gives an overview of the parameters to be sampled for this CPA individually, or for *groups of CPAs* to which this CPA belongs:

Parameter	Means of monitoring	Monitoring frequency
N_y	***Dispenser Spot-Checks*** The number of functional chlorine dispensers is derived from functionality checks. In case a dispenser is found to be non-functional, the status of the respective dispenser is recorded as "non-functional" in the master database. N_y is determined by multiplying the total number of installed dispensers by the fraction of functional dispensers at a defined cut-off date (= end of monitoring period). Functionality = the dispenser releases 3 ml of chlorine when the valve is turned. (In case the dispenser is empty, chlorine is added and the dispenser is checked again) Type of parameter: Numeric value Confidence/precision level**:** *All* devices are checked In case of any failure, community users can contact the local promoters who will then get in touch with the Evidence Action. Thereafter Evidence Action's field associates will assess the cause of failure and fix or replace the dispenser.	Annual

Parameter	Means of monitoring	Monitoring frequency
QPW_y	***Refill#*** Means of monitoring: Chlorine Delivery Records The number of chlorine jerricans delivered to promoters is recorded. Refill# is determined by adding up chlorine consumption at all chlorine dispensers functional during the monitoring period. It shall be assumed that the average chlorine consumption was constant between the last chlorine delivery before the cutoff date and the first chlorine delivery after the cutoff date. Type of parameter: Numeric value Confidence/precision level: Chlorine consumption is monitored for *all* dispensers.	Annually

Refill%

Means of monitoring: Promoter Survey

Interviews with randomly selected promoters.

Question: “From the time that you receive the jerrican of chlorine to the time that the chlorine is put into the dispenser, what percentage of chlorine is lost?”

Type of parameter: Proportion value
Confidence/precision level**:** 90/10
Sampling method: Simple random sampling

Sample size determination:
The formula used to calculate the sample size is as follows (sourced from “Guideline for Sampling and surveys for CDM project activities and programmes of activities” version 04.0 Page 28):

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$

Where:
n = sample size
N = total number of water points (1,250)
p = Our expected proportion (0.90)
1.645 = Represents the 90% confidence required
0.1 = Represents the 10% relative precision

By substituting the above values, the sample size n ≥14. However, as per “Standard for Sampling and surveys for CDM project activities and programmes of activities” version 05.0 Para 13: *If the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion*, therefore the minimum sample size for Refill% is defined as 30 (n ≥30).

	Drink% Means of monitoring: Community Adoption Survey Interviews with randomly selected households that are using water from randomly selected chlorine dispensers. Question: "What is your primary use for chlorinated water?" and "What percentage of your chlorinated water is used for [primary use]?" Type of parameter: Proportional value Confidence/precision level: 90/10 Sampling method: Cluster sampling Sample size determination: The formula used to calculate the sample size is as follows (sourced from "Guideline for Sampling and surveys for CDM project activities and programmes of activities" version 04.0 Page 33): $c \geq \frac{1.645^2 MV}{(M-1)\times 0.1^2 + 1.645^2 V}$ Where: $V = \frac{SD_B{}^2}{\bar{p}^2} = \frac{\text{variance between clusters (villages)}}{\text{average proportion}}$ c = Number of clusters (i.e. water points for the CPA) to be sampled M = Total number of water points (1,250) 1.645 = Represents the 90% confidence required 0.1 = Represents the 10% relative precision required SD^2_B = Expected unit variance (0.025) p = Average proportion (0.9) By substituting the above values, the number of water points to be sampled c ≧8.3, rounded up to 9. Therefore the minimum number of water points to be sampled is 9 (c ≧ 9).	
Note: Refill% and Drink% may be sampled for a group of CPAs as specified in the following sub-sections.		

Parameter	**Means of monitoring**	**Monitoring frequency**

Water quality	Water quality tests. Up to 10 E. coli CFU/100 ml shall be acceptable.[10] Total Chlorine Residual (TCR) is used to identify water that has been chlorinated. All household stored water samples that test positive for TCR are then tested for E.coli. The fraction of households with sufficient water quality is established as number of samples with E.coli below 10 CFU/100 ml divided by the number of samples that tested positive for the presence of TCR. Type of parameter: Proportion value Confidence/precision level: 95/10 (except the monitoring period is below one year and carried out for only one CPA, in this case a confidence/precision level of 90/10 shall be sufficient) Sampling method: Cluster sampling Sample size determination: it has been defined in the subsequent sections. The water quality may be sampled for a group of CPAs as specified in the following sub-sections.	Annual
POP_y	Means of monitoring: Dispenser Spot-Checks At the time when functionality of dispensers is tested, the promoter is asked about the number of households using the waterpoint where the chlorine dispenser is installed. No sampling is required as POP_y is established based on data from all devices. Every year the POP_y will be updated in the ER calculation sheet.	Annual

Sampling Design

Due to the large number of dispensers envisaged to be installed as part of this CPA, it is not economically feasible to monitor each individual unit for each parameter. Therefore, representative sampling will be undertaken as part of a Sampling Plan that is designed in line with the requirements of AMS-III.AV Version 03 and the "Standard for sampling and surveys for CDM project activities and programme of activities" Version 05.0 (the Sampling Standard).

(i) Objectives and Reliability Requirements
The objective is to obtain a reliable and conservative estimate of the variables listed in the table above over the course of the crediting period and meeting the indicated confidence/precision levels. The frequency of sampling will always comply with the requirements of the methodology and the Sampling Standard.

(ii) Target Population
The overall target population is the end users of chlorine dispensers installed as a result of the CPAs implemented under the PoA. Each dispenser casing is marked with a unique identification number on a scannable asset tag, which is part of the CPA installation records. A list of all users of a water point is compiled during the community education meeting.

Therefore, each end user is linked to a cluster (in this case the water point with a dispenser) and each chlorine dispenser is assigned to a specific CPA. The end user's premises can be visited during monitoring. The information is collected by Evidence Action, and is stored on the shared drive maintained by the CME in the CPA specific folder.

[10] WHO classifies a contamination of up to 10 E. coli CFU/100 ml as low risk (see: Table 5.2 on page 78 of Guidelines for drinking-water quality, second edition, Volume 3 Surveillance and control of community supplies)

(iii) Sampling Method
Grouping of CPAs will be performed according to the following two criteria:

- Technology
- Host-country

This means that this CPA will only be grouped with other, future CPAs involving the installation of chlorine dispensers in Uganda.

Within each group, clustered sampling will be undertaken for the water quality monitoring, to account for the fact that the end users will be grouped geographically according to their water point where the dispenser is installed. The clusters to be sampled will be drawn from a list of all chlorine dispensers (clusters) within the project boundary, and during sampling all the end users linked to that selected dispenser (cluster) will be visited (identified by the water point household list which was established during the community education meeting). In case not all the end users could be visited during monitoring within one cluster, the sampled values from the cluster will be retained if i) a maximum two observations were missing per cluster[11] or if ii) the estimates for that said cluster reach the required reliability (e.g. 95% or 90% confidence, 10% precision) of the sampling campaign.

The sampling will be done using an Excel spreadsheet or Stata software, which will be programmed to randomly select numbers corresponding to the unique ID numbers of the clusters.

More chlorine dispensers (and users of the respective water points) will be selected for sampling than is required by the sample size, to ensure that if there are any household water purification devices that are unable to be reached and/or households not willing to provide responses, the required accuracy is still achieved.

(iv) Sample Size
The size of the sample for each sampling frame for the water quality monitoring is determined by the requirement to achieve 95/10 confidence/precision (or 90/10 confidence/precision in case of annual verification of a single CPA) for the estimation of the proportion value of the parameter investigated.

In order to calculate the required sample sizes, estimates for the proportion value and its standard deviation shall be used. For the subsequent monitoring periods, the estimates shall be adjusted taking the results of the previous monitoring period(s) into account.

The following estimates shall be used for the first monitoring period of this CPA:

Parameter	Estimated value	Justification
Percentage of treated water meeting water quality requirements	90%	Based on monitoring results from Uganda CPA 2 where 86 out of 92 water tests (from end users with total chlorine residual in the drinking water) showed E. coli contamination greater than 10 CFU/100 ml.
Standard deviation of safe water (SD^2)	0.025	Calculated, based on a realistic example of the water quality in households using different chlorine dispensers.

[11] This is in line with the "Guidelines for sampling and surveys for CDM project activities and programme of activities", Version 04.0

Following equation[12] for estimating the cluster size is applied (cluster sampling):

$$c \geq \frac{conf^2 \times M \times V}{(M-1) \times precision^2 + conf^2 \times V}$$

Where:

$$V = \frac{SD_B{}^2}{\bar{p}^2}$$

Parameter	Description	Value applied
c	Number of clusters to be sampled	x
M	Total number of clusters (water points)	1,250
p	Average proportion or cluster mean	90%
conf	Constant referring to the level of confidence (1.645 for 90% confidence, 1.96 for 95% confidence)	1.645 or 1.96
precision	Required precision (i.e. 10% = 0.1)	0.1
SD^2	Variance between clusters (water points)	0.025

Using the above assumptions, we receive the following minimum cluster size:

Parameter	Minimum size (90% confidence)	Minimum size (95% confidence)
Water quality	9	12

Therefore it is expected that all users of 12 water points need to be sampled (to achieve 95% confidence) or all users of 9 water points (to achieve 90% confidence) in order to get estimates of the required precision. Prior to the first sampling campaign the latest available estimates on the mean values and standard deviations will be used, so the actual cluster size might differ from the above calculated value in subsequent samples.

(v) Sampling Frame
Generally, the above mentioned parameters are sampled among all chlorine dispensers for groups of CPAs as indicated above. In case a CPA cuts across these groups, it will be monitored individually. Hence, the overall sampling frame consists of all installed chlorine dispensers, represented by their unique identification numbers stored on the shared drive maintained by the CME in the CPA specific folder.

Data management

(i) Field Measurements
The following parameters will be measured as indicated below:

Parameter	Methods to be applied	Comments on seasonal fluctuation
Existence of public distribution network of supplying safe	Interview with local Resident	Unlikely to fluctuate seasonally

[12] Equation according to the Guidelines for sampling and surveys for CDM project activities and programme of activities (version 04.0)

Parameter	Methods to be applied	Comments on seasonal fluctuation
drinking water	District Commissioners (RDC)	
N_y	Physical inspection of dispenser	Unlikely to fluctuate seasonally
Water quality	Household survey	Unlikely to fluctuate seasonally
Refill#	Monitoring of delivered 5 L chlorine jerricans to promoters	Unlikely to fluctuate seasonally
Refill%	Promoter survey	Unlikely to fluctuate seasonally
Drink%	Community survey (household survey)	Unlikely to fluctuate seasonally
POP_y	Dispenser Spot-Checks	Unlikely to fluctuate seasonally

(ii) Quality Assurance/Quality Control:

The potential for non-responses, refusals and related issues will be considered during sample selection. If the sampling results are insufficient to achieve the target reliability levels, the CME may request Evidence Action to remedy this situation in a number of ways: Selecting a larger than necessary sample size before commencing monitoring can help to ensure that an adequate number of responses are obtained during monitoring. If it is necessary to engage third parties for carrying out field measurements, the CME will ensure that any such third parties are credible, experienced, and adequately trained for the tasks they are contracted for (e.g. carrying out water quality tests) in line with the noted methodology. Training will be provided to the parties carrying out the actual field measurements on how to deal with non-responses etc. if necessary.

The calculation of the sample size will be carried out using estimates for proportions, mean of values and standard deviations since the actual characteristics of the population/sampling frame are unknown ex ante. In order to ensure the quality of the sampling results, the CME can draw on the provisions for reliability calculations as provided by the *Guidelines for Sampling and Surveys for CDM project activities and programme of activities Version 04.0*. In the event that the sampling results do not fulfil the required level of confidence and precision, the CME will request Evidence Action to sample additional clusters. If the reliability is still not sufficient after additional samples, the sampling may be repeated with an increased sample size.

The data contained in each individual CPA Monitoring Record and collected during field measurements will be transferred to the CME by Evidence Action. The CME will be responsible to ensure that such data is stored on the shared drive maintained by the CME in the CPA specific folder.

(iii) Analysis:

The data obtained from sampling of each CPA will be used to estimate values for the parameters described above for use in GHG ER calculations.

(c) Implementation

(i) Implementation Plan

It is envisaged that Evidence Action will implement the Sampling Plan (Monitoring Plan) over the course of the PoA, including contracting all necessary third parties who would be responsible for actual field measurements, under the guidance of the CME. The actual timing will depend on the speed of CPA inclusion and chlorine dispenser installation.

The skills and experience required for the data collection activities under the Sampling Plan may include:

- Experiences with field water quality testing
- Experience conducting door-to-door surveys
- Local language skills and English language skills

- Cultural awareness
- Numerical proficiency
- Data entry skill

B.5.3. Other elements of monitoring plan

>>
N/A

SECTION C. Start date, crediting period type and duration

C.1. Start date of CPA

>>
03/08/2014
This is the date of installation of the first dispenser[13] in Sironko District, Uganda as part of CPA 9.

C.2. Expected operational lifetime of CPA

>>
The expected operational lifetime of the CPA is 21 years. The chlorine dispenser hardware has a lifetime of 5 years. Non-functional dispensers will be replaced by Evidence Action.

C.3. Crediting period of CPA

C.3.1. Type of crediting period

>>
Renewable crediting period.

C.3.2. Start date of crediting period

>>
13/09/2016, the CPA inclusion date.

C.3.3. Duration of crediting period

>>
The length of the 1st renewable crediting period is 7 years, which is from 13/09/2016 to 12/09/2023.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The National Environment Management Authority (NEMA) decides on environmental impact assessments (EIA) requirements. The PoA received the LoA from the Ugandan DNA on 06/01/2012 and the CPA is in line with national environmental laws. No environmental impact assessment is required for this project activity according to the Host Party requirement.

[13] The first dispenser was installed at the water point ID. 1016594 on 3rd August 2014.

D.2. Environmental impact assessment

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No environmental impact assessment is required for this project activity according to the Host Party requirement.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

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The local stakeholder consultation was organized according to the rules and requirements of the Gold Standard Foundation and was designed for future CPAs under the IWPP. A physical meeting was held on Thursday, 7 November 2013 at 9:00 – 13:00 at the Hotel Africana in Kampala, Uganda. The 55 interested participants represented end users from the project area in Eastern Uganda, local and national government (including representatives from the Western Region), donors, international and local NGOs. In the invitation letter sent to more than 200 people, the stakeholders were invited to provide feedback. Additional feedback was collected during the UWASNET CSO Forum on October 17-18, 2013 in Kampala. As the project will apply the GS, a local stakeholder consultation report was completed on 2016-05-12 to illustrate all the local stakeholder consultation process.

E.2. Summary of comments received

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The feedback was mostly very positive and many stakeholders requested that the project expand to other areas in Uganda. Some questions were raised about the effectiveness of the technology, the sustainability of the program and the voluntary work involved from community members. There have been no environmental concerns raised during the stakeholder consultation process.

As a whole the project is perceived to be positive in terms of the three categories of sustainability: environment, society and economy.

Stakeholder comment	Explanations by CME and Evidence Action
Faster and further expansion of the project.	Evidence Action is currently expanding its operations in Eastern Uganda and will start piloting the dispensers in Western Uganda in early 2014.
Promoters want to be hired as field staff.	Evidence Action always publically advertises open positions. In the transparent hiring process promoters with the required qualifications have the same chances to get the job as all other applicants.
The project is based on a lot of voluntarism from community side.	Community management (unpaid) of water points is very common in rural Uganda and often an important factor for ensuring sustainability. Nevertheless, Evidence Action is currently testing different models for increasing promoters' motivation. In case regular salaries are shown to increase the consumption of chlorine-treated water, payments may be introduced in future.
No income generating activity is attached to this project.	The project does not include a direct income generating part for the target communities. Nevertheless, chlorine dispensers will reduce the burden of disease and increase the number of productive working days. The saved time can be used for income generating activities.

Why does the community waive all rights of carbon credits?	Legal ownership of the installed chlorine dispenser hardware lies with Evidence Action. Community buy-in is achieved through an initial vote of whether they would like a chlorine dispenser, as well as through their voluntary provision of sand and ballast for the hardware installation. In exchange for having free access to the dispenser, the community (as represented by the dispenser promoter or village elder) signs the rights for the emissions reductions generated by the dispenser over to Evidence Action. In addition, it is technically and financially impossible for individual households or communities to claim carbon credits for their chlorine dispensers. The carbon revenue will directly benefit the end users by operating and maintaining the chlorine dispensers free of charge.
There is not enough data to effectively conclude the achievements.	Evidence Action is keen to measure the impact of the chlorine dispenser program and puts extensive effort into monitoring activities compared with many other implementers of water projects. Experiences from Kenya (a dataset of almost four years) show that adoption rates are around 43%. Evidence Action will continue to collect all data necessary to improve its activities and achieve sustainable health gains in the project areas.
Risk of undermining efforts to improve access to sound water supply infrastructure.	The chlorine dispenser technology can be equally effective next to improved and unimproved water sources. Evidence Action continues to encourage governments, businesses, and NGOs to improve water supply infrastructure, but recognizes that a desire for improved infrastructure in the future does not mean that households with no other choice in the present should not have an opportunity for access to safe water when it can be provided at a low cost.
Risk of project being counter-productive to promoting hygiene at household level.	The chlorine dispenser system is not an alternative to other hygiene promotion activities at a household level, but it is used to supplement them. Evidence Action supports hygiene promotion efforts and does not interfere with them. Additionally, Evidence Action coordinates with village health teams on their efforts, which include health/hygiene promotion. Chlorination is very effective in this context because it provides protection from recontamination during transport or storage for up to 72 hours.
Doubts regarding sustainability because a single promoter instead of a water user committee is responsible for the operation and maintenance.	Evidence Action actively works with the Water User Committees (WUCs) and the Village Health Teams (VHTs). They are invited to all meetings and are encouraged to promote and become engaged with the chlorine dispenser system. This is really important for the program as they are responsible of the water source (in the case of the WUCs) and for health promotion (in the case of the VHTs). The program asks the community to elect a promoter; and an assistant promoter to support the promoter's promotion and maintenance efforts. Regular phone calls and visits to the water source ensure sustained communication and enable the replacement of the promoter if they are ever unable to effectively perform their duties. Water User Committees are not disbanded upon promotion of the dispenser. The promoter does not replace the WUC but is an additive component of attention to water safety

	within the community.
Doubts of sustainability due to costs and supply chain.	Dispenser access is free to users. Evidence Action does not solely rely on donations or grant funding to cover the costs of service delivery. Instead, Evidence Action works with experts to develop, monitor, audit, issue and sell dispenser carbon credits. The revenues earned from carbon sales are used to reinvest in the program, ensuring that dispensers are sustainable over the long term, including chlorine delivery (free of charge) to the promoters for regular refills of the dispensers. The promoter reports any damages on the dispenser back to Evidence Action so that the dispenser can be replaced.
In rural and urban water supply people hardly boil water for drinking.	According to the Uganda DHS in 2011[14], boiling is a fairly common practice in rural and urban Uganda. The survey report shows that 37.7% of rural households in Uganda boil their drinking water; and 3.6% use other adequate household water treatment technologies. If end users had the required hygiene knowledge and the financial means to treat their water, it is assumed that most households would chose boiling for purifying their drinking water as this is the most common treatment option. In urban Uganda 70.6% of the households boil their drinking water according to the DHS.
Difficulty of measuring the project-related emission reductions.	The project-related emission reductions and avoidance are monitored and quantified based on a methodology registered with the UNFCCC under the Clean Development Mechanism (AMS-III.AV Version 03).

E.3. Consideration of comments received

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The stakeholders provided very valuable feedback that will be taken into account as the program continues to scale up. Nevertheless, none of the comments required an immediate adjustment of the implementation strategy. See explanations by CME and Evidence Action in section E.2.

SECTION F. Eligibility for inclusion

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
1	Technology requirements	The water purification technologies include either: 1. Water filters (membrane, activated carbon, ceramic filters), solar energy powered UV disinfection devices,	Specification of water purification device: **Chlorine dispenser** *1.* Injection-moulded HDPE dispenser	**Yes**, the CPA involves a chemical disinfection method (chlorination). And as per section B.4.3 of the CPA-DD, the ex-ante project emissions are calculated as zero,

[14] Uganda Demographic and Health Survey 2011, issued by Uganda Bureau of Statistics, Kampala, Uganda

		other solar disinfection techniques (SODIS), photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (chlorination), combined treatment approaches (flocculation plus disinfection) 2. A low greenhouse gas emitting technology: related ex-ante project emissions are less than 10% of the ex-ante baseline emissions calculated as per section B.4.3. of the CPA DD.	casing 2. Blow-moulded HDPE dispenser tank with a capacity of 3 litres 3. Dispenser tank valve that delivers a precise 3ml dose of chlorine solution **Capacity** 20 Liters per 3 ml dose **Effectiveness** Chlorine effectively removes bacteria and viruses **Simple application** Very low operation requirements, no power needed **Lifetime** Around 5 years	which is obviously less than 10% of the ex-ante baseline emissions.
2		Water purification technologies involve point-of use (POU) or point-of-entry treatment systems for residential or institutional applications such as systems installed at a school or a community center.	Specification of chlorine dispensers and CPA implementation plan (see section A.7.)	**Yes**, chlorine dispensers are a point-of entry water treatment system for residential applications installed at community center and eligible under the applied methodology, see request for clarification to the CDM SSC WG: F-CDM-SSCwg SC_673
3		The application of the project technology/equipment achieves compliance either with: (i) at a minimum the "interim" performance target as per "Evaluating household water treatment options: Health based targets and microbiological performance specifications" (WHO, 2011); or (ii) an applicable national standard or guideline.	Evaluating household water treatment options: Health based targets and microbiological performance specifications" (WHO, 2011)	**Yes**, chlorination meets the "interim" performance target. According to Table A2.4. (p.52) in the referred WHO documents chlorination achieves a 3-log removal for bacteria, viruses and most protozoa and thus meets the 'protective' performance as shown in Figure 1 (p.4) in the same document. Despite chlorine not being effective against Cryptosporidium oocysts, many studies confirm public health

				gains through appliance of chlorination for water disinfection (see WHO Guidelines for Drinking-water Quality, Fourth Edition).
4		Prior to the implementation of the project activity, a public distribution network supplying safe drinking water (SDW) to the project boundary does not exist.	Water Point Verification by Evidence Action.	**Yes**, no chlorine dispensers are installed in communities with access to a reliable piped water supply system distributing safe drinking water.
5		In cases where the life span of the water treatment technologies is shorter than the crediting period of the project activity, there shall be documented measures in place to ensure that end users have access to replacement purification systems of comparable quality.	As per CPA implementation plan, the promoter will be responsible for reporting any maintenance or service requirement. The chlorine will be delivered at regular intervals to the promoters. The record of operational devised will be documented on continuous basis.	**Yes**, measures are in place to ensure that chlorine is refilled regularly and broken chlorine dispensers are replaced with systems of comparable quality. For detailed justification, please refer to the section A.3.
6	Applicability of the methodology	Applicability of the methodology is foreseen in the following types of situations that shall be reassessed at the beginning of each crediting period: (a) **Case 1**: Project activities implemented in rural or urban areas[15] of countries with proportion of rural population using an improved drinking-water source equal to or less than 60% confirmed by 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	"Water Supply Atlas 2010" is publicly available statistical data from a government agency (i.e. Ministry of Water and Environment, Republic of Uganda).	**T**he project activity falls into **Case 2**. According to data from the "Water Supply Atlas 2010" (the most recent public data available disaggregated at the district level from Ministry of Water and Environment, Republic of Uganda), 63.8% of rural population within the project boundary has access to an improved water source, which is more than the maximum 60%. (see section B.4.1.)

[15] As per the WHO/UNICEF Joint Monitoring Programme for water supply and sanitation.

		used (<http://www.wssinfo.org/dataestimates/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 an university; (iii) Using survey methods (use 90/10 confidence/ precision for sampling); (b) **Case 2**: Project activities implemented in areas not included in case 1.		
7	Boundary and location of the CPA	The CPA is located within one of the host countries listed in section A.5. of the PoA DD. CPA involves only one host country.	The CPA project boundary is limited to one host country, Uganda	**Yes**, the CPA is located in Uganda, which is listed in section A.5. of the PoA-DD.
8	Avoidance of double counting	The CPA is exclusively bound to the PoA. Confirmation that the PoA has not been and will not be registered either as a single CDM project activity or as a CPA under another POA.	A statement is included in the CPA-DD that the specific CPA will not be part of another single CDM project activity or CPA under another PoA (see section A.4.13.). CDM projects registered in Uganda were checked on UNFCCC website on 18/07/2016.	**Yes**, the CPA is not part of another single CDM project activity or CPA under another PoA.
9		A unique numbering or identification system for the water purification devices disseminated is applied.	Chlorine dispenser database	**Yes**, each dispenser casing is marked with a unique identification number on a scannable asset tag, which is part of the CPA installation records. A list of all users of a water point is compiled during the community education meeting.

10	Start date	The CPA start date (first appliance sold or distributed) shall be after the PoA validation start date (webhosting date, i.e. 29/07/2011). In case any deployed water purification devices are found not in line with the CPA start date requirement, those devices will not be counted for emission reduction calculation. The CPA crediting period shall be limited by the PoA crediting period.	No water purification device under the CPA was installed before 29/07/2011 CPA first crediting period is 7 years, starting from 01/09/2016[16], until 31/08/2023. The PoA crediting period is 28 years starting 16/11/2012, until 15/11/2040.	**Yes**, the CPA start date is **03/08/2014**, which is after the PoA registration date and the CPA crediting period will expire before the end of the PoA crediting period.
11	Additionality of CPAs	The CPA shall satisfy the following additionality test based on the GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES (Version 09.0): The CPA shall solely be composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size[17] of each unit is no larger than 5% of the small-scale CDM thresholds	Calculation showing that each of the devices achieves an annual emission reduction equal to or less than 3,000 tCO_2e per year[18]. (see section B.4.4.)	**Yes**, the project is solely composed of isolated units where the users are communities and ex-ante emission reduction estimate from each functional unit is 50.2 tCO_2e per year, which is clearly below the threshold of 3,000 tCO_2e per year. Therefore the project is additional.
12	SSC Limit for CPAs	The annual emissions reductions of each CPA shall not go beyond the limits of 60ktCO_2e/y over the entire crediting period.	Calculation showing emission reductions (see section B.4.4.)	**Yes**, the ex-ante annual emissions reductions of the CPA do not exceed 60ktCO_2e/y over the entire crediting period. As per the ex-ante calculation, the maximum annual emission reduction per

[16] Expected inclusion date in the International Water Purification Programme PoA.

[17] That is the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.

[18] 5% of the small-scale CDM threshold is equivalent to 3,000 tCO2e per year.

				year is 59,619tCO_2e.
13	Sampling requirements	The conditions related to sampling requirements for the PoA are in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys (Standard for sampling and surveys for CDM project activities and programme of activities, Version 05.0 and Guidelines for sampling and survey for CDM project activities and programme of activities Version 04.0) and are in line with the requirements of the applied methodology AMS.III.AV, version 03.0.	As specified in the sampling plan in the CPA-DD (see section B.5.2.) and according to the sampling requirements specified at the PoA level.	**Yes**, sampling requirements are in line with the applied methodology and standards for sampling.
14	De-bundling	Each water purification device reduces less than 600 tCO_2e/y.[19]	Calculation showing emission reduction per device and year (see section A.8.)	**Yes**, functional chlorine dispensers reduce 50.2 tCO_2e per year which is less than 600 tCO_2e per year.
15	Contractual agreement	The CPA implementer has signed a contractual agreement with the CME to participate in the PoA. Such agreement guides the transfer of the emission reduction rights to the CME.	Contract between Evidence Action and the CME	**Yes,** Evidence Action has signed an agreement with Pure Water Ltd. (CME) to participate in the PoA on the 9th October 2013.
16	Local Stakeholder Consultation	A local stakeholder consultation has been conducted for CPA.	Local Stakeholder Consultation Report (meeting Gold Standard requirements)	**Yes**, a local stakeholder consultation was conducted on 7th November 2013, and a Local Stakeholder Consultation Report is available.

[19] According to the Methodological tool "Assessment of debundling for small-scale project activities, v04.0 (EB 83, Annex 13, Para. 17) for determining the occurrence of debundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is not larger than 1% of the small scale threshold defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity.

17	Environmental Analysis	CPA is in line with the environmental host Party laws/regulations.	The PoA has received the LoA of the DNA of Uganda and is in line with environmental regulations from Uganda.	**Yes**, the CPA is in line with the environmental regulations from Uganda.
18	Diversion of official development assistance	CPA should not result into the diversion of official development assistance	Declaration from CME (see section A.6.)	**Yes**, the CPA does not result in diversion of Official Development Assistance (ODA)
19	Target group	CPA shall target residential or institutional applications	Technical description of CPA (see section A.3.)	**Yes**, the CPA targets residential applications.

Appendix 1. Contact information of CPA implementers

Organization name	Alethia Solutions, Inc., doing business as Evidence Action
Country	USA
Address	1731 Connecticut Ave NW, 4th floor, Washington, D.C.
Telephone	+ 1 857 417 4065
Fax	+ 1 857 417 4065
E-mail	alexandra.cosman@evidenceaction.org
Website	www.evidenceaction.org
Contact person	Alexandra Cosman

Appendix 2. Affirmation regarding public funding

Evidence Action has received financial assistance from the Development Innovation Ventures (DIV) fund of the United States Agency for International Development (USAID). This funding does not result in diversion of Official Development Assistance (ODA) and is not counted towards the financial obligation of the United States.

Appendix 3. Further background information on ex ante calculation of emission reductions

Baseline Survey

A baseline study was conducted by Evidence Action on January 25th – February 6th 2016, in order to determine (i) the type of stoves and fuel used to boil water and (ii) the prevalence of household water treatment technologies and methods prior to the project implementation in target households in Mbale and Sironko districts. At the time of the survey 1,209 chlorine dispensers had been installed within the CPA boundaries.

Target Population

The communities that will be using the 1,250 chlorine dispensers in the project area comprise rural villages which can be considered as similar in terms of their living conditions. The target population comprises a total of 60,760 households based on 43.4 households per water point (determined previously by Evidence Action as part of the Water Point Verification).

Sampling Method and Size

A multi-stage sampling approach has been chosen as the most suitable sampling method as per Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0), EB 86. It has been chosen to survey 8 households per water point ID (this is the number of households that one enumerator can do in one day).

The required sample size was estimated using equation (16) on page 34 in Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0), EB 86. In order to achieve a 90% confidence interval and a 10% precision, a sample size of 8 and 13 water points, respectively, with 8 households surveyed at each water point is required (based on the parameters listed in the tables below). In total 50 water points were selected randomly and at each water point 8 randomly selected households were visited (N = 397). In three locations either more or less than 8 households were visited (5, 7 and 9 households).

Table 1: Parameters to determine the a sample size achieving 90/10 confidence/precision (Stoves)

Parameter	Value	Justification
Error Margin	*10%*	*Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0), EB 86*
Confidence Level	*1.645*	*Represents the 90% confidence required. Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0)*
Total number of groups	*1,209*	*Expected number of water points where chlorine dispensers are or will be installed.*
Average units per group	*43.4*	*Expected average number of households per water point (based on water point verification)*
Expected overall proportion	*90.8%*	*Expected proportion of households using a conventional, unimproved cook stove for boiling water.*
Expected unit variance	*0.0161*	*Expected variance between users of different water points (type of stoves). Based on CPA 3.*
Expected average of the group variances	*0.0677*	*Expected average variance of users of the same water point (type of stoves). Based on CPA 3.*

Table 2: Parameters to determine the a sample size achieving 90/10 confidence/precision (Boiling)

Parameter	Value	Justification
Error Margin	*10%*	*Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0), EB 86*
Confidence Level	*1.645*	*Represents the 90% confidence required. Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 04.0)*
Total number of groups	*1,250*	*Expected number of water points where chlorine dispensers are or will be installed.*
Average units per group	*43.4*	*Expected average number of households per water point (based on water point verification)*
Expected overall proportion	*86.7%*	*Expected proportion of households that boil or would have boiled their drinking water. Based on CPA 3.*
Expected unit variance	*0.0269*	*Expected variance between users of different water points (prevalence of boiling). Based on CPA 3.*
Expected average of the group variances	*0.0896*	*Expected average variance of users of the same water point (prevalence of boiling). Based on CPA 3.*

Sampling Frame

From a comprehensive database containing water points where chlorine dispensers have been installed in the CPA 9 project area, a total of 50 IDs were selected randomly using the statistical software package Stata. All eligible water point IDs were sorted on a random number generated with Stata's built-in runiform() function which generates a random distribution. The lowest 50 values emerging out of this randomization then provided the 50 water points selected for the sample. In total 397 households were interviewed.

Once the randomly selected water points are known an in-field randomization was used to randomly selecting the households for the survey. A pre-randomized order of numbers ranging from 1-80 as calculated by Excel's RAND() function was brought to the field and a household list prepared in the field. If for example, the first number is 17, then the household name that was listed 17th on the household list would be the first to be surveyed.

Results

The results of the survey are presented in Table 3 below.

Wood is the predominant fuel in the project area, used in 94.2% of all households and 94.2% of all firewood and charcoal stoves sampled are considered as conventional. Charcoal is seen in only rare occasions. No households were found that use agricultural residuals for boiling drinking water. One household reported to use LPG.

The required 90/10 confidence/precision requirement is clearly met with 90% confidence that the prevalence of unimproved cook stoves is 94.2% (+/- 10.0%).

The weighted average stove efficiency in the project area is estimated to be 10.65%.

Table 3: Stove and fuel types used for the calculation of the weighted average stove efficiency

Waterpoint ID	# Interviews	Three stone with firewood	Unimproved firewood stove	Improved firewood stove	Conventional charcoal stove	Improved charcoal stove	LPG	Total
7050064	8	7	0	1	0	0	0	8
7050236	8	5	0	0	3	0	0	8
7050240	8	5	1	1	1	0	0	8
7050245	8	6	1	0	0	1	0	8
7050248	8	7	1	0	0	0	0	8
7050252	8	4	1	0	2	1	0	8
7050261	8	3	1	4	0	0	0	8
7050267	8	8	0	0	0	0	0	8
7050297	8	8	0	0	0	0	0	8
7050306	8	5	2	0	1	0	0	8
7050386	8	8	0	0	0	0	0	8
7050412	8	7	0	1	0	0	0	8
7050413	8	7	1	0	0	0	0	8
7050509	8	7	0	0	1	0	0	8
7050516	8	3	0	1	3	0	1	8
7050532	8	7	0	0	1	0	0	8
7050534	8	6	1	1	0	0	0	8
7050694	8	4	1	0	3	0	0	8
7050857	8	7	0	1	0	0	0	8
7050858	8	7	0	1	0	0	0	8
7040036	8	7	1	0	0	0	0	8
7040062	8	7	1	0	0	0	0	8
7040065	8	2	2	4	0	0	0	8
7040115	8	6	1	1	0	0	0	8
7040117	8	5	1	2	0	0	0	8
7040132	7	7	0	0	0	0	0	7
7040210	8	5	2	0	1	0	0	8
7040321	8	5	3	0	0	0	0	8
7040343	8	7	1	0	0	0	0	8
7040347	8	4	4	0	0	0	0	8
7040358	8	7	1	0	0	0	0	8
7040363	8	6	1	1	0	0	0	8
7040375	8	7	0	0	0	1	0	8
7040388	8	6	2	0	0	0	0	8
7040422	8	8	0	0	0	0	0	8
7040425	8	8	0	0	0	0	0	8
7040437	8	6	2	0	0	0	0	8
7040460	8	5	3	0	0	0	0	8
7040511	9	9	0	0	0	0	0	9
7040520	8	6	1	0	1	0	0	8
7040571	8	8	0	0	0	0	0	8
7040654	8	4	4	0	0	0	0	8
7040678	8	7	1	0	0	0	0	8
7040705	8	8	0	0	0	0	0	8
7040706	8	7	0	0	1	0	0	8
7040710	8	7	1	0	0	0	0	8
7040735	8	3	5	0	0	0	0	8
7040738	8	6	1	0	1	0	0	8
7040741	8	8	0	0	0	0	0	8
7040757	5	3	2	0	0	0	0	5
Total (Number)	397	305	50	19	19	3	1	397
Total (%)		76.8%	12.6%	4.8%	4.8%	0.8%	0.3%	100%
Default stove efficiency (%)		10%	10%	20%	10%	20%	50%	
Weighted average stove efficiency			**10.65%**					

In total 244 interviewed households reported that they used to boil their drinking water before consumption. Out of the 151 households that currently do not treat their drinking water or using an inadequate method, 97 households reported that they would boil their drinking water if they had more money and/or time available. 2 households reported that they used to treat their water with chlorine before the chlorine dispenser was installed.

Thus, in total 341 out of 397 households (85.9%) are or would have been boiling their drinking water as a means of making it safe for consumption.

The required 90/10 confidence/precision requirement is met with 90% confidence that the prevalence of unimproved cook stoves is 85.9% (+/- 10.0%).

The average for $POP_{Boiling}$ in the project area is estimated to be 85.9%.

Table 4: Prevalence of boiling as a water treatment method

Waterpoint ID	# Interviews	Water made safe (Yes)	Water made safe (No)	Boiling	Chlorine	Inadequate	Would boil if enough resources (Yes)	Would boil if enough resources (No)	Would boil (%)	$POP_{Boiling}$
7050064	8	8	0	8	0	0	0	0	n/a	100%
7050236	8	8	0	8	0	0	0	0	n/a	100%
7050240	8	1	7	1	0	0	6	1	86%	69%
7050245	8	5	3	5	0	0	3	0	100%	87%
7050248	8	4	4	2	1	1	5	0	100%	65%
7050252	8	1	7	1	0	0	5	2	71%	69%
7050261	8	6	2	5	0	1	3	0	100%	87%
7050267	8	5	3	5	0	0	3	0	100%	87%
7050297	8	2	6	2	0	0	2	4	33%	73%
7050306	8	5	3	5	0	0	3	0	100%	87%
7050386	8	4	4	4	0	0	2	2	50%	82%
7050412	8	5	3	5	0	0	3	0	100%	87%
7050413	8	6	2	6	0	0	2	0	100%	91%
7050509	8	2	6	2	0	0	5	1	83%	73%
7050516	8	8	0	8	0	0	0	0	n/a	100%
7050532	8	0	8	0	0	0	8	0	100%	64%
7050534	8	8	0	8	0	0	0	0	n/a	100%
7050694	8	8	0	8	0	0	0	0	n/a	100%
7050857	8	7	1	7	0	0	1	0	100%	96%
7050858	8	7	1	7	0	0	1	0	100%	96%
7040036	8	1	7	1	0	0	0	7	0%	69%
7040062	8	8	0	8	0	0	0	0	n/a	100%
7040065	8	8	0	8	0	0	0	0	n/a	100%
7040115	8	0	8	0	0	0	8	0	100%	64%
7040117	8	5	3	5	0	0	3	0	100%	87%
7040132	7	5	2	5	0	0	0	2	0%	90%
7040210	8	7	1	7	0	0	0	1	0%	96%
7040321	8	0	8	0	0	0	0	8	0%	64%
7040343	8	1	7	1	0	0	7	0	100%	69%
7040347	8	6	2	6	0	0	2	0	100%	91%
7040358	8	3	5	3	0	0	4	1	80%	78%
7040363	8	1	7	1	0	0	0	7	0%	69%
7040375	8	4	4	4	0	0	4	0	100%	82%
7040388	8	7	1	7	0	0	1	0	100%	96%
7040422	8	6	2	6	0	0	1	1	50%	91%
7040425	8	5	3	5	0	0	0	3	0%	87%
7040437	8	8	0	8	0	0	0	0	n/a	100%
7040460	8	8	0	8	0	0	0	0	n/a	100%
7040511	9	9	0	9	0	0	0	0	n/a	100%
7040520	8	6	2	6	0	0	2	0	100%	91%
7040571	8	8	0	8	0	0	0	0	n/a	100%
7040654	8	6	2	6	0	0	1	1	50%	91%
7040678	8	0	8	0	0	0	0	8	0%	64%
7040705	8	7	1	5	1	1	2	0	100%	79%
7040706	8	6	2	6	0	0	2	0	100%	91%
7040710	8	8	0	8	0	0	0	0	n/a	100%
7040735	8	4	4	4	0	0	1	3	25%	82%
7040738	8	1	7	1	0	0	7	0	100%	69%
7040741	8	8	0	8	0	0	0	0	n/a	100%
7040757	5	3	2	3	0	0	0	2	0%	86%
Total	397	249	148	244	2	3	97	54	64.2%	85.9%
$POP_{Boiling}$		85.9%								

Appendix 4. Further background information on monitoring plan

Monitoring information is provided in section B.5.2 of the CPA-DD.

Appendix 5. Summary report of comments received from local stakeholders

Summary report of comments received from local stakeholders is provided in section E.2 of the CPA-DD.

Appendix 6. Summary of post-registration changes

The main changes of this post registration changes are summarized as below:

The type error of “Latitude: S 0.9866° – 1.2638°” has been corrected to “Latitude: N 0.9866° – 1.2638° “ as the project is located in the north equator.

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Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	20 October 2017	Editorial revision to remove appendix "Applicability of methodologies and standardized baselines" from the main part of the form which had been mistakenly kept in the previous version.
08.0	28 June 2017	Revision to: • Remove appendix "Applicability of methodologies and standardized baselines" as the appendix is not relevant at the CPA level; • Make editorial improvement.
07.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and PoA-DD forms; • Make editorial improvement.
06.0	24 May 2017	Revision to: • Ensure consistency with the "Standard: CDM project standard for programme of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Component project activity design document form for small-scale component project activities" (CDM-SSC-CPA-DD-FORM); • Make editorial improvement.
05.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
04.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
03.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the component project activity design document form for CDM component project activities (these instructions supersede the "Guidelines for completing the component project activity design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a CPA implementer and/or responsible person/ entity for completing the CDM-CPA-DD-

Version	*Date*	*Description*
		FORM in A.13. and Appendix 1; • Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and Appendix 6; • Change the reference number from F-CDM-CPA-DD to CDM-CPA-DD-FORM; • Make editorial improvement.
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the component project activity design document form" (EB 66, Annex 16).
01.0	27 July 2007	EB 33, Annex 42 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: component project activity, project design document