Monitoring report form for CDM programme of activities
(Version 02.0)

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

MONITORING REPORT		
Title of the PoA	International Water Purification Programme	
UNFCCC reference number of the PoA	5962	
Version numbers of the PoA-DD applicable to this monitoring report	07	
Version number of this monitoring report	04~~3~~2	
Completion date of this monitoring report	25~~13~~/12~~1009~~/2018	
Monitoring period number	4th monitoring period	
Duration of this monitoring period	01/06/2016- 31/12/2017	
Monitoring report number for this monitoring period	01	
Coordinating/managing entity	Pure Water Ltd.	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Uganda	**Yes**
	Ethiopia	No
	Gambia	No
	Kenya	No
	Madagascar	No
	South Africa	No
	Egypt	No

	El Salvador	No
	Mexico	No
	Nicaragua	No
	Chile	No
	Iran	No
	Vietnam	No
	Cambodia	No
	Malawi	No
Sectoral scopes	Sectoral scope 3 : Energy demand	
Applied methodologies and standardized baselines	AMS-III.AV. "Low greenhouse gas emitting safe drinking water production systems (version 03)"	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0 tCO_2e	~~290,620~~~~271,340~~239,885 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	426,597 tCO_2e	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

>>

This PoA seeks to further the access of households and communities to clean and safe drinking water, by promoting low greenhouse gas emitting water purification technologies. This PoA is thus primarily designed for the long-term improvement of the living conditions of local people. The targeted users of such technologies will be households and/or communities. Examples of technologies include, but are not limited to, water filters (e.g. membrane, activated carbon, ceramic filters), solar technologies (Ultra violet disinfection devices, solar water disinfection SODIS), photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (eg. chlorination), combined treatment approaches (eg. Flocculation plus disinfection), etc.

The PoA reduces the use and demand for fossil fuels and non-renewable biomass that would have been used to boil water as a mean of water purification in the absence of the Programme of Activities. This directly leads to reduced greenhouse gas emissions.

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

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
International water purification programme The approved PoA-DD: PART II. Generic component project activity (CPA)	version 07	Sectoral scope 3: Energy demand	AMS-III.AV. Low greenhouse gas emitting safe drinking water production systems (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 05) •Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 02) •Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 01)

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
5962-0001 (CPA-1)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 01/11/2013-30/10/2020	**Yes**
5962-0002 (CPA-2)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 17/07/2014-16/07/2021	**Yes**
5962-0003 (CPA-3)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 15/04/2015 – 14/04/2022	**Yes**
5962-0004 (CPA-5)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015):	version 07	Renewal 19/11/2015 - 18/11/2022	No

	PART II. Generic component project activity (CPA)			
5962-0005 (CPA-6)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 21/01/2016 – 20/01/2023	No
5962-0006 (CPA-7)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 21/01/2016 – 20/01/2023	No
5962-0007 (CPA-8)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 21/01/2016- 20/01/2023	No
5962-0008 (CPA-9)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 13/09/2016 – 12/09/2023	**Yes**
5962-0009 (CPA-10)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 13/09/2016 – 12/09/2023	**Yes**
5962-0010 (CPA-11)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 13/09/2016- 12/09/2023	No
5962-0011 (CPA-12)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 13/09/2016 – 12/09/2023	No
5962-0012 (CPA-13)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 13/09/2016 – 12/09/2023	No
5962-0013 (CPA-14)	**International water**	version 07	Renewal	No

	purification programme The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)		13/09/2016 – 12/09/2023	
5962-0014 (CPA-4)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 01/01/2017 – 31/12/2023	No
5962-0015 (CPA-15)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 01/02/2017 – 31/01/2024	No
5962-0016 (CPA-20)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 01/02/2017 – 31/01/2024	No
5962-0017 (CPA-21)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 01/02/2017 – 31/01/2024	**Yes**
5962-0018 (CPA-22)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 01/02/2017 – 31/01/2024	**Yes**
5962-0019 (CPA-16)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 06/06/2017 – 05/06/2024	**No**
5962-0020 (CPA-17)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 06/06/2017 – 05/06/2024	**No**
5962-0021 (CPA-18)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic	version 07	Renewal 06/06/2017 – 05/06/2024	**No**

	component project activity (CPA)			
5962-0022 (CPA-19)	**International water purification programme** The approved PoA-DD (version 07, 13/04/2015): PART II. Generic component project activity (CPA)	version 07	Renewal 06/06/2017 – 05/06/2024	**No**

A.2. Coordinating/managing entity

>>

Jessie Zhang, Pure Water Ltd. (CME), j.zhang@thesouthpolegroup.com

The detailed contact information of CME are provided in Appendix 1.

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

>>

The management system has been implemented as described in the validated PoA-DD ('Operational and management plan') and in accordance with applicable provisions on the implementation of the management system in the Project Standard. The PoA is managed by the CME (Pure Water Ltd.) with CPA Managers responsible for the coordination with the CPA Implementers (CPA 1: Water School Uganda; CPA 2, 3, 9, 10, 21 and 22: Evidence Action). Detailed roles and responsibilities of CME and CPA Implementers are described in the PoA-DD.

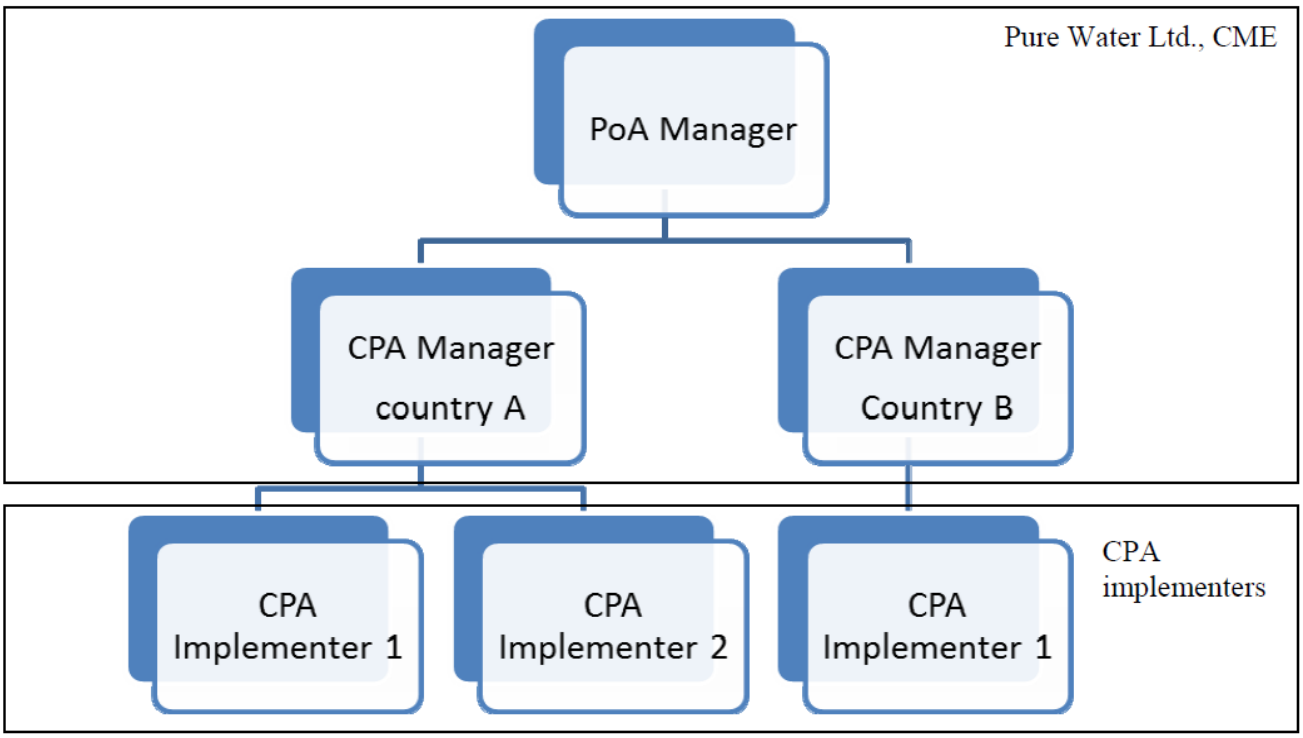

Figure: Overview of organizational structure

In order to ensure that CPAs comply with the double counting avoidance requirement stated in the PoA-DD, the CPA Manager checked every new CPA against the CPAs in the exisiting PoA database and the list of project acitivities that are under validation or registered at the UNFCCC.

All CPA-related data are stored electronically and/or in hard copy formats. The dispenser databases of CPA 2, 3, 9, 10, 21 and 22 contain details about the unique waterpoint IDs, installation dates and administrative units in which the dispensers were installed.

In this monitoring period the single sampling plan was implemented combined for the involved CPAs as the same technology has been used in the same host-country.

B.2. Post-registration changes to PoA

B.2.1. Corrections

>>
No corrections were made to the registered PoA-DD (including the generic CPAs).

B.2.2. Inclusion of monitoring plan

>>
No monitoring plan was included to the registered PoA-DD.

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

>>
No permanent changes were made to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline.

B.2.4. Changes to programme design

>>
No changes were made to the programme design of the registered PoA-DD during the current monitoring period.

PART II Monitoring of CPAs

>>
Evidence Action had the responsibility to monitor and record all relevant parameters for CPA 2, 3, 9, 10, 21 and 22. The procedure is in line with the monitoring plan described in the CPA-DD.

Parameters to be monitored

-Existence of public distribution network supplying safe drinking water
(see 'Interviews' below)
-Number of functional chlorine dispensers (N_y)
(see 'Data Records' below)
-Number of persons supplied with purified water from each chlorine dispenser (POP_y)
(see 'Data Records' below)
-Average number of refills per functional dispenser (Refill#)
(see 'Data Records' below)
-Fraction of delivered chlorine available for use in dispenser (Refill%)
(see 'Surveys' below)
-Fraction of water treated with the dispenser that is actually drunk (Drink%)
(see 'Surveys' below)
-Water quality *(see 'Surveys' below)*

The data were collected through three main monitoring activities:

a) Data Records (Refill#, N_y and POP_y)

Refill#: Promoters received chlorine in 5 L jerricans from Evidence Action. Each time chlorine was handed out to a promoter, it was recorded by Evidence Action.

Evidence Action regularly monitored the consumption of chlorine through the chlorine usage data to ensure the chlorine delivery/consumption is reasonable. Refill# is determined by adding up chlorine consumption at all chlorine dispensers functional during the monitoring period. Note: chlorine usage at non-functional dispensers was assumed to be always 0. The CME made a consistency check for the results.

The chlorine consumption was monitored and recorded by Evidence Action. In case of missing data, it is assumed that no chlorine was used.

N_y: Through random spot-checks the functionality of the chlorine dispenser was checked by Evidence Action field staff using a mobile phone-based recording format (dispenser spot-check). The records were uploaded to a master database on a central server and analysed by Evidence Action. In case a dispenser was found to be non-functional, the status of the respective dispenser was recorded as "non-functional" in the respective CPA's dispenser database. In case the dispenser is empty, chlorine is added and the dispenser is checked again. The CME made a consistency check for the results.

POP_y: Number of persons supplied with purified water from each chlorine dispenser (POP_y) of Case 2[1] CPAs, i.e. (CPA9 and CPA22, which) should be checked annually and once every two years, respectively. For other CPAs which fall under Case 1, as per paragraph 3(a) in AMS-III.AV version 03, POP_y is an ex-ante determined value and does not need to be updated.

However, to enhance the accuracy and completeness of the monitoring program, Evidence Action performed a population cross check survey and voluntarily updated the POP_y of CPA 2, 3, 10 and 21 as well as CPA9 and CPA22 in November and December 2017. The survey result of POP_y for each CPA (CPA2, 3, 9, 10, 21 and 22) is considered conservative and therefore adopted during this monitoring period. Please refer to Section E.2 for more details.

Separate monitoring results of individual CPAs are shown as below:

	CPA2	CPA3	CPA9	CPA10	CPA21	CPA 22
Refill#	14.69	12.52	9.44	11.19	7.16	7.83
N_y	1,087	949	1,0811~~2~~	800	748	543
POP_y	198	157	178	225	219	229

b) Interviews (Existence of public distribution network suppliying safe drinking water)

The local governmental bureaus were visited by Evidence Action field staff to determine if a public distribution network supplying safe drinking water was constructed within the project area. Details are provided in a separate document.

Separate monitoring results of individual CPAs are shown as below:

	CPA2	CPA3	CPA9	CPA10	CPA21	CPA 22
Existence of public distribution	No public distribution network	No public distribution network	No public distribution network	No public distribution network	No public distribution network	No public distribution network

[1] According to the registered CPA DDs, the application of Case 1 or Case 2 should be re-assessed at the beginning of each crediting period. The CME has checked the most recent public data available and found the data of "Water Supply Atlas 2010" was not updated at the beginning of the crediting period for CPA 9 (13/09/2016), CPA10(13/09/2016), CPA21(01/02/2017) and CPA22(01/02/2017). Therefore, the Case 1 or Case 2 for CPA 9/10/ 21/22 remains the same without any update.

network suppliying safe drinking water	suppliying safe drinking water	suppliying safe drinking water	suppliying safe drinking water	suppliying safe drinking water	suppliying safe drinking water	suppliying safe drinking water

c) Surveys (Refill%, Drink% and Water Quality)

Refill%, and Drink% were quantified through surveys.

For Water Quality, water samples were collected from the households who use the dispensers to purify their drinking water, and tested for E.coli by Evidence Action. For more details please refer to Section E.2.

The sampling surveys for Drink% and Water Quality were performed between 19 October 2017 ~~in October and~~and 10 November 2017.

Monitoring results of group CPAs are shown as below:

	CPA2	CPA3	CPA9	CPA10	CPA21	CPA 22
Refill %	99.64%	99.64%	99.64%	99.64%	99.64%	99.64%
Drink %	96.10%	96.10%	96.10%	96.10%	96.10%	96.10%
Water Quality	~~85.7%~~82.75%	~~85.7%~~82.75%	~~85.7%~~82.75%	~~85.7%~~82.75%	~~85.7%~~82.75%	~~85.7%~~82.75%

For CPA-2, CPA-3, Evidence Action has performed monitoring survey for Drink% and water quality in 2016 and 2017 respectively. However, the verification of 3rd monitoring period revealed some issues with the implementation of the monitoring plan[2]. Consequently, Evidence Action has decided to ensure compliance with the registered monitoring plan and adopt the 2017 survey for this monitoring period.

For CPA-2/3, Drink% and water quality in previous survey in 3rd monitoring period were lower than 50%. CPA-2/3, it complies with the section 4.8.1 of "General guidelines for SSC CDM methodologies version 22.1" (hereafter referred to as SSC-guideline). Since both values of parameter of Drink% and water quality in previous survey in 3rd monitoring period were lower than 50%. Considering the statistical concept of both parameters, the verification team regards less than 50% dispensers can provide safe drinking water, i.e. less than 50% of the distributed units are functional. Thus, the surveys did not satisfy the conditions in paragraph 27 of SSC-Guideline.

Therefore, the CME adopted the result obtained from the surveys started from 19/10/2017 for the period from 01/06/2016 to 19/10/2017 referring to para.30 and the first figure in Figure 2 of the SSC-Guideline. Consider the 2017 survey is not sufficient to cover the period from 20/10/2017 to 31/12/2017 of this monitoring period. Therefore, the CME will not claim the ERs generated from 20/10/2017 to 31/12/2017 (73-day) for both CPA-2/3, and an adjusting factor of 87.39%, i.e. (579-73)/579 is introduced for CPA 2/3 to fulfil the monitoring validity.

CPA 9/10 were only included into the PoA on 13/09/2016 and this is the first monitoring period for CPA 9/10. The survey conducted in 2017 is considered only valid for one-year period (01/01/2017 to 31/12/2017) as per the monitoring requirment, and is not sufficient to cover the whole monitoring period (13/09/2016 to 31/12/2016). Therefore, the CME will not

[2] Please refer to the 3rd verification report: https://cdm.unfccc.int/PoAIssuance/iss_db/poaiss396060045/view

claim the ERs generated from 13/09/2016 to 31/12/2016 (110-day) for both CPA 9/10, and an adjusting factor of 76.84%, i.e. (475-110)/475 is introduced for CPA 9/10 to fulfil the monitoring validity.

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

>>

The start date of CPA 1 Gravity Driven Membrane Filters in Uganda (CDM# 5962-0001) is still pending (no Gravity-Driven ultrafiltration Membranes filter has been distributed at of the end of this monitoring period) and no CERs will be claimed for CPA 1 for the indicated monitoring period. No further information or monitoring data are provided in this monitoring report regarding CPA 1.

The implementation of the project activities of following CPAs were carried out in accordance with the registered CPA-DDs, including:

•CPA 2 Chlorine Dispensers in Uganda (CDM# 5962-0002)
•CPA 3 Chlorine Dispensers in Uganda (CDM# 5962-0003)
•CPA 9 Chlorine Dispensers in Uganda (CDM# 5962-0008)
•CPA 10 Chlorine Dispensers in Uganda (CDM# 5962-0009)
•CPA 21 Chlorine Dispensers in Uganda (CDM# 5962-0017) and
•CPA 22 Chlorine Dispensers in Uganda (CDM# 5962-0018)

Till 31/12/2017, the total eligible chlorine dispensers installed within the defined project boundary are listed as below:

	CPA2	CPA3	CPA9	CPA10	CPA21	CPA 22
Total installed eligible chlorine dispensers[3]	1,133	1,006	1,1012	810	845	580

In order to avoid double-counting each water source is given a unique ID, which is recorded in a central database of Evidence Action.

The CPA implementer is aware that the CPA will be subscribed to this present PoA and cedes its rights to claim and own emission reductions under the Clean Development Mechanism to the managing entity of this present PoA. The CPA implementer has warranted that the proposed CPA is neither registered as an individual CDM project, nor is it part of another registered PoA, nor is it a CPA that has been excluded from a registered CDM PoA as a result of erroneous inclusion of CPAs.

Purpose of the project activity CPA 2, 3, 9, 10, 21 and 22

The CPAs seek to further the access of households and communities to safe drinking water, using a low greenhouse gas emitting water purification technology, chlorine dispensers. 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 reduced greenhouse gas emissions.

Applicability of methodology

[3] During this monitoring period, the CME has set eligibility criteria for the installed dispensers for conservative consideration. Dispensers were considered as non-eligible if key information for unique identification of the water point is missing or if chlorine dispensers were not maintained during the monitoring period. Dispensers which do not meet the eligibility criteria are deemed to be non- eligible and no CERs will be claimed from the non-eligible dispensers.

No events or situations occurred during the monitoring period that may have impacted the applicability of the applied methodology AMS-III.AV version 03.

Brief description of the installed technology and equipment

Chlorine dispensers have been installed in the project activity (CPA 2, 3, 9, 10, 21 and 22).

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 3ml dose of chlorine
Marine padlock	Imported from China
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
Load factor	28,800 L per day[4]

Relevant dates for the project activity

Timeline CPA	
29/07/2011	Validation start date of IWPP (PoA)
16/11/2012	Registration of the PoA under the CDM of the UNFCCC.
08/04/2013	Start date of CPA 2: installation of the first 12 dispenser in the roll-out phase (in Kibuku district, Kasasira sub-county).
09/10/2013	Emission Reduction Purchase Agreement signed between Pure Water Ltd. (the CME) and Evidence Action (implementer).
22/01/2014	Start date of CPA 3: installation of the first 2 dispenser (in Manafwa district, Bukiabi sub-county).
17/07/2014	CDM inclusion date of CPA2.
03/08/2014	Start date of CPA 9: installation of the first dispenser (in Sironko district, Bukiise sub-county).
August 2014 – November 2014	Installation of 1,209 chlorine dispensers in the Sironko and Mbale districts in Eastern Uganda as part of CPA 9
10/11/2014	Start date of CPA 21: installation of the first 51 dispensers.
December 2014 – February 2015	Installation of 850 chlorine dispensers in the Butaleja District and Namutumba District of Eastern Uganda as part of CPA 21
31/01/2015	Cut-off date monitoring period#1: 1,150 chlorine dispensers installed
15/04/2015	CDM inclusion date of CPA3.
27/04/2015	Start date of CPA 10: installation of the first dispenser.
April 2015 – July 2015	Installation of 833 chlorine dispensers in the Pallisa district of Eastern Uganda as part of CPA 10
30/09/2015	Cut-off date monitoring period#2: 1,150 chlorine dispensers installed (CPA 2) and

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

	1,013 dispensers installed (CPA 3)
04/11/2015	Start date of CPA 22: installation of the first 13 dispensers.
November 2015 – October 2016	Installation of 600 chlorine dispensers in the Tororo District of Eastern Uganda as part of CPA 22
31/05/2016	Cut-off date monitoring period#3: 1,150 chlorine dispensers installed (CPA 2) and 1,013 dispensers installed (CPA 3)
13/09/2016	CDM inclusion date of CPA9.
13/09/2016	CDM inclusion date of CPA10.
01/02/2017	CDM inclusion date of CPA21.
01/02/2017	CDM inclusion date of CPA22.
31/12/2017	Cut-off date monitoring period#4: 1,133 eligible chlorine dispensers installed (CPA 2), 1,006 dispensers eligible installed (CPA 3), 1,1012 eligible chlorine dispensers installed (CPA 9), 810 eligible chlorine dispensers installed (CPA 10), 845 eligible chlorine dispensers installed (CPA 21), 580 eligible chlorine dispensers installed (CPA 22)

Achieved emission reductions

Total GHG emission reductions achieved during this monitoring period are ~~290,620~~271,340239,885 **tCO_2e**.

CPA	**Monitoring Period #4** (01/06/2016 – 31/12/2017)
CPA 1	0
CPA 2	~~78,428~~75,72866,180
CPA 3	~~53,845~~51,99145,436
CPA 9	~~50,293~~44,73737,281[5]
CPA 10	~~53,209~~47,37639,480[6]
CPA 21	~~32,145~~31,039[7]
CPA 22	~~22,700~~20,469[8]
Total	**~~290,620~~271,340239,885**

C.2. Location of CPAs

>>

The physical boundary of CPA 2, 3, 9, 10, 21 and 22 are the communities who use the water points where chlorine 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.

[5] Only including CERs generated after CPA inclusion date (13/09/2016)

[6] Only including CERs generated after CPA inclusion date (13/09/2016)

[7] Only including CERs generated after CPA inclusion date (01/02/2017)

[8] Only including CERs generated after CPA inclusion date (01/02/2017)

CPA 2

- •Budaka district (all sub-counties), N 01° 00' 44.32", E 33° 48' 35.99"
- • Kibuku district (all sub-counties), N 01° 04' 12.48", E 33° 59' 50.30"
- •Manafwa district (Tsekukulu, Mukoto, Buwabala, Bukhabusi, Bukhaweka, Bupoto, Namabaya, Bumbu and Bukhoko sub-counties), N 00° 52' 40.72", E 34° 18' 51.38"

CPA 3

- •Manafwa district (Bututu, Bukiabi, Bumwoni, Lwakhakha TC, Magale, Namboko, Bugobero, Bukhofu, Bukhusu, Bunabwana, Busukuya, Butiru, Butta, Buwagogo, Kaato, Khabutoola, Manafwa TC, Nalondo, Sibanga, Sisuni and Wesswa sub-counties)
  N 00° 52' 40.72", E 34° 18' 51.38"
- •Mbale district (Bubyangu, Bufumbo, Bukhiende, Lukhonge, Busiu, Bumasikye, Busoba, Nyondo and Busanosub-counties), N 01° 00' 05.18", E 34° 10' 27.76"

CPA 9

- •All dispensers are located within Budadiri East and Budadiri West in Sironko District, Bungokho North and Bungokho South in Mbale District, Uganda.
  Longitude: E 34.1146° – 34.4270°, Latitude: N 0.9866° – 1.2638°

CPA 10

- •All dispensers are located within Agule, Pallisa and Butebo, Pallisa District, Uganda.
- •Longitude: E 33.5220° – 34.1745°, Latitude: N 1.0837° – 1.3268°

CPA 21

- •All dispensers are located within Butaleja District (involved counties: Bunyole East and Bunyole West) and Namutumba District (involved county: Busiki), Uganda.
- •Longitude: E 33.5508° – 34.1291°, Latitude: N 0.6959° – 1.0400°

CPA 22

- •All dispensers are located within Busia District (involved county: Samia North) and Tororo District (involved counties: Tororo, West Budama North, and West Budama South), Uganda.

Longitude: E 33.8000° – 34.4000°, Latitude: N 0.4000° – 0.9000°

C.3. Post-registration changes to CPAs

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

>>

No temporary deviations from registered monitoring plan or applied methodology were necessary for the involved CPAs since the start date of the project activities.

C.3.2. Corrections

>>

No corrections were made to the registered CPA DDs.

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

>>

No changes were made to the start date of the crediting period.

C.3.4. Inclusion of monitoring plan

>>

No monitoring plan was included into the specific-case CPAs that was not included at registration.

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

>>

~~No permanent changes were made to the monitoring plan as described in the registered CPAs, applied methodology, or applied standardized baseline.~~CPA 2 and CPA 3 DDs have been updated to version 06 to include~~ed~~ permanent changes as followes:

1.The monitoring frequency of the parameter "Water quality", "Refill%" and "Drink%" was changed from "Annual" to "Annual or biennial".

2.The template of CPA DD form is updated from version 05.0 to version 08.1.

~~1.~~3.Some format adjustment, wording changes, errors corrections and other necessary corrections based on a matter of fact.

C.3.6. Changes to project design

>>

No Change was made to the project desing during this monitoring period.

SECTION D. Description of monitoring system of CPAs

>>

Evidence Action had the responsibility to monitor and record all relevant parameters for CPA 2, 3, 9, 10, 21 and 22. The procedure is in line with the monitoring plan described in the CPA-DD.

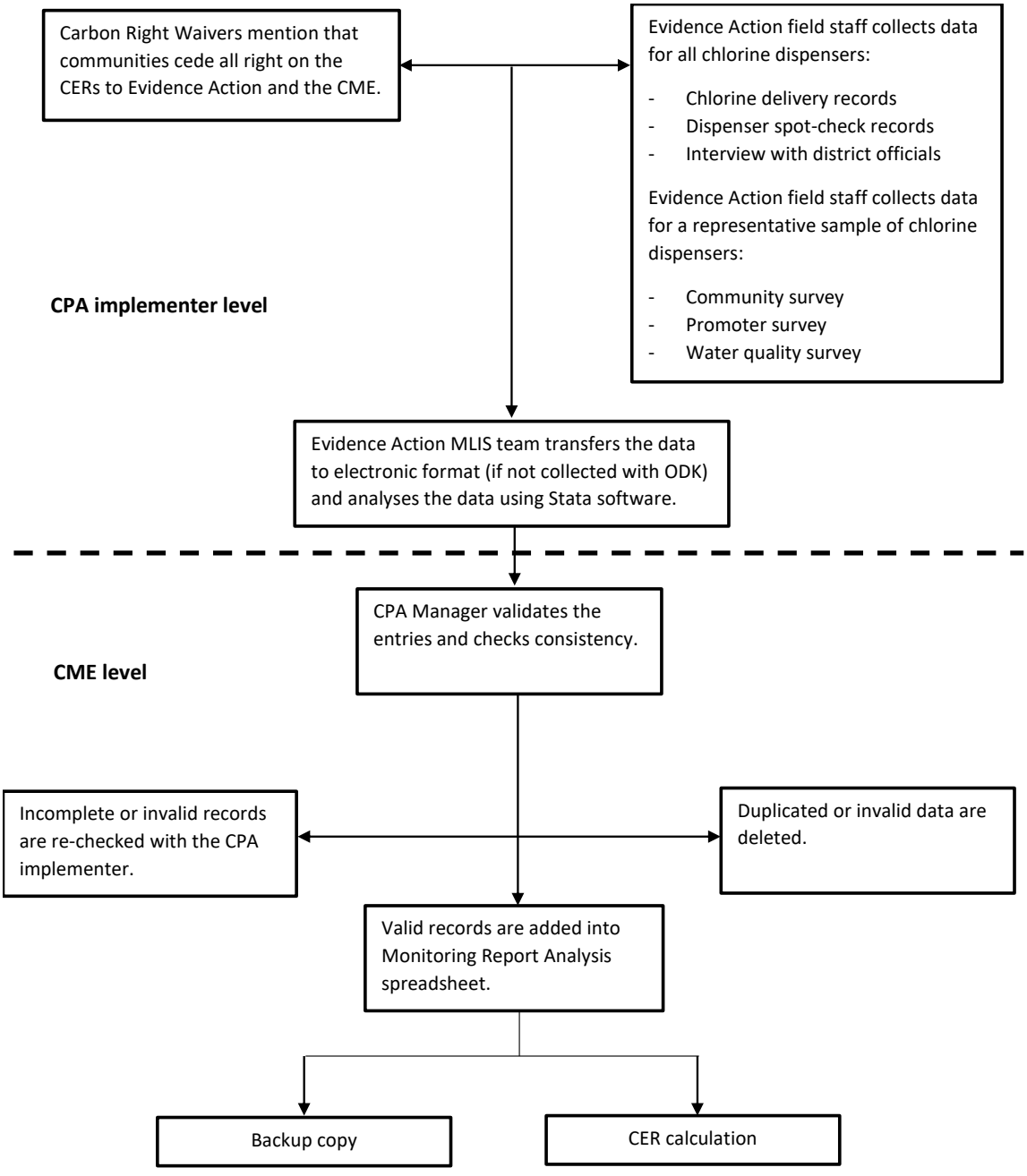

Figure: Records and documentation control process for CPA 2, 3, 9, 10, 21 and 22

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

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	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	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	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	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) [9]
Purpose of data	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	10.83% (CPA 2), 10.92% (CPA 3), 10.65% (CPA 9), 10.44% (CPA 10), 10.17% (CPA 21) and 10.35% (CPA 22)
Choice of data or measurement methods and procedures	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 0.20 default value will optionally be used. 0.50 default value will be used if the replaced system or the system that would have been used is a fossil fuel combusting system. Use weighted average values if more than one type of system is encountered.
Purpose of data	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	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	32,971 (CPA 2), 32,680 (CPA 3), 33,115 (CPA 9), 33,293 (CPA 10), 32,715 (CPA 21) and 33,333 (CPA 22)

[9] WHO guidelines for Emergency Treatment of drinking water at point of the use

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)
Purpose of data	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%).

Data / Parameter	**POP_P**
Data unit	-
Description	Number of persons supplied with purified water from each of the functional project appliances
Source of data	Water Point Verification
Value(s) applied	198 (CPA 2), 157 (CPA 3), 178 (CPA 9), 225 (CPA 10), 219 (CPA 21) and 229 (CPA 22)
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 point of each CPA was established as below[10]: For CPA 2: POP_P = 53.8 households * 5.6 people/household = 301 For CPA 3: POP_P = 51.2 households * 5.6 people/household = 286 For CPA 9: POP_P = 43.4 households * 5.6 people/household = 243 For CPA 10: POP_P = 60 households * 5.6 people/household = 336 For CPA 21: POP_P = 65 households * 5.6 people/household = 364 For CPA 22: POP_P = 59.6 households * 5.6 people/household = 334 However, to enhance the accuracy and completeness of the monitoring program, Evidence Action performed a population check survey and voluntarily updated the POPy of CPA2, 3, 10 and 21 as well as CPA9 and CPA22 in 2017.
Purpose of data	Calculation of baseline emissions
Additional comment	

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[11]. 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	Calculation of baseline emissions
Additional comment	

Data / Parameter	**$POP_{Boiling}$**
Data unit	-

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

[11] 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

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
Value(s) applied	85.9% (CPA 9) and 83.0% (CPA 22) CPA 2, 3, 10 and 21 fall under Case 1 per paragraph 3(a) in AMS-III.AV version 03 and thus $POP_{Boiling}$ does not need to be considered.
Choice of data or measurement methods and procedures	Survey
Purpose of data	Calculation of baseline emissions
Additional comment	The project activity falls under Case 1 per paragraph 3(a) in AMS-III.AV version 03 and thus $POP_{Boiling}$ does not need to be considered. 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. According to the registered CPA DDs, the application of Case 1 or Case 2 should be re-assessed at the beginning of each crediting period. The CME has checked the most recent public data available and found the data of "Water Supply Atlas 2010" was not updated at the beginning of the crediting period for CPA 9 (13/09/2016), CPA10(13/09/2016), CPA21(01/02/2017) and CPA22(01/02/2017). Therefore, the Case 1 or Case 2 for CPA 9/10/ 21/22 remains the same without any update.

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 dispenser
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

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 dispenser
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of project emissions
Additional comment	-

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	-
Purpose of data	Calculation of leakage
Additional comment	

E.2. Data and parameters monitored

(Copy this table for each data or parameter.)

Data / Parameter:	**QPW_y**
Unit:	Liters
Description:	Quantity of purified water in year y
Measured/ Calculated / Default:	Calculated
Source of data:	Derived from the capacity of the equipment established by the manufacturers' specifications, the number of functional project appliances, average number of refills per functional dispenser and two adjustment factors of Refill% and Drink%. $QPW_y = L_P * N_y *$ Refill# * Refill% * Drink%
Value(s) of monitored parameter:	436,155,489 [CPA 2] , 301,934,315 [CPA 3], ~~275,043,940~~274,789,741 [CPA 9], 285,256,804 [CPA 10], 167,875,681 [CPA 21] and ~~120,650,164~~112,669,141 [CPA 22]
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	N/A
Calculation method (if applicable):	N/A
QA/QC procedures:	N/A
Purpose of data:	Calculation of baseline emissions
Additional comment:	QPW_y 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.

Data / Parameter:	**N_y**
Unit:	-
Description:	Number of functional chlorine dispensers in monitoring period
Measured/ Calculated / Default:	Measured
Source of data:	Periodical physical inspection of each device (spot-checks). N_y is derived from regular functionality checks. In case a dispenser was found to be non-functional, the status of the respective dispenser was recorded as "non-functional" in the central database. In addition, dispensers that had no reported chlorine deliveries were also assumed to be non-functional. N_y was determined by multiplying the total number of eligible dispensers by the fraction of functional dispensers at the cut-off date (31/12/2017).
Value(s) of monitored parameter:	1,087 [CPA 2] , 949 [CPA 3], 1,081~~2~~ [CPA 9], 800 [CPA 10], 748 [CPA 21] and 543 [CPA 22]

Monitoring equipment:	Physical inspection of all dispensers in rotation.
Measuring/ Reading/ Recording frequency:	Annually ~~Physical inspection of all dispensers in rotation.~~
Calculation method (if applicable):	N/A~~Annually~~
QA/QC procedures:	In case a dispenser was not operating and has not been replaced at the cut-off date (31/12/2017), it was excluded from the emission reduction calculation for the whole monitoring period.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Refill#**
Unit:	-
Description:	Average number of refills per functional dispenser per year
Measured/ Calculated / Default:	Measured
Source of data:	Number of chlorine containers delivered to promoters (chlorine delivery records) When new chlorine is delivered to a promoter, the number of containers delivered and the number of containers in stock are recorded. Refill# was determined by adding up all chlorine used during the monitoring period. For calculating Refill# only dispensers recorded as 'functional' at the cut-off date were considered.
Value(s) of monitored parameter:	14.69 [CPA 2] , 12.52 [CPA 3], 9.44 [CPA 9], 11.19 [CPA 10], 7.16 [CPA 21] and 7.83 [CPA 22] during this monitoring period.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	At least annually
Calculation method (if applicable):	Based on chlorine delivery records and number of functional dispensers
QA/QC procedures:	Evidence Action regularly monitored the consumption of chlorine through the chlorine usage data to ensure the chlorine delivery/consumption is reasonable. Refill# is determined by adding up chlorine consumption at all chlorine dispensers functional during the monitoring period. Chlorine usage at non-functional dispensers was assumed to be always 0. The CME made a consistency check for the results.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Refill%**
Unit:	%
Description:	Fraction of delivered chlorine available for use in dispenser
Measured/ Calculated / Default:	Measured
Source of data:	Promoter survey. Survey question: "From the time that you receive the jerrican of chlorine to the time that the chlorine is put into the dispenser, is any chlorine lost?"

Value(s) of monitored parameter:	99.64%
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	At least annually
Calculation method (if applicable):	N/A
QA/QC procedures:	The CME made a consistency check for the results. In case of any data error for a specific result, the result would be set as “0”.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Drink%**
Unit:	%
Description:	Fraction of water treated with the dispenser that is actually drunk
Measured/ Calculated / Default:	Measured
Source of data:	Interview question included in water quality survey. Survey question: “What is your primary use for chlorinated water?” and “How much of your chlorinated water is used for [primary use]?”
Value(s) of monitored parameter:	96.10%
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Clustered sampling was undertaken for the Drink% monitoring; during this monitoring period, Drink% was surveyed from all the households who use the dispensers to purify their drinking water for the selected clusters. At least annually
Calculation method (if applicable):	N/A
QA/QC procedures:	The CME made a consistency check for the results. In case of any data error for a specific result, the result would be set as “0”.
Purpose of data:	Calculation of baseline emissions
Additional comment:	The 2017 sampling survey for Drink% was performed between 19 October 2017 and 10 November 2017.

Data / Parameter:	**Existence of public distribution network supplying safe drinking water**
Unit:	-
Description:	Existence of public distribution network supplying safe drinking water to the project boundary in year y
Measured/ Calculated / Default:	Interviews
Source of data:	Interviews with the local officals at the district bureau to determine if a piped water supply exists for the sub-counties included in the CPA.
Value(s) of monitored parameter:	0 (no households need to be discounted)
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annual

Calculation method (if applicable):	N/A
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:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Water quality**
Unit:	-
Description:	Water quality
Measured/ Calculated/ Default:	Measured
Source of data:	Sampling surveys
Value(s) of monitored parameter:	~~85.7%~~82.75%
Monitoring equipment:	Hach Color Wheel for Total Chlorine Residual (TCR) and IDEXX machine for E.coli
Measuring/ Reading/ Recording frequency:	Clustered sampling was undertaken for the water quality monitoring. Water samples were collected from all the households who use the dispensers to purify their drinking water for the selected culsters, and tested for E.coli by Evidence Action. Water quality is monitored at least annually as per registered CPA DD.
Calculation method (if applicable):	The fraction of households with sufficient water quality was established as the number of water samples with E.coli below 10 CFU/100 ml divided by the number of total water samples.
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:	Calculation of baseline emissions
Additional comment:	The 2017 sampling survey for water quality was performed between 19 October 2017 and 10 November 2017.

Data / Parameter:	**POP_y**
Unit:	-
Description:	Number of persons supplied with purified water from each of the functional project appliances
Measured/ Calculated / Default:	measured
Source of data:	Survey
Value(s) of monitored parameter:	198 (CPA 2), 157 (CPA 3), 178 (CPA 9), 225 (CPA 10), 219 (CPA 21) and 229 (CPA 22)
Monitoring equipment:	Survey
Measuring/ Reading/ Recording frequency:	CPA9: annually CPA 21: a~~A~~t least every two years. Not applicable to CPA2, 3, 10, and 22 as they fall to Case 1 projects.
Calculation method (if applicable):	N/A
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:	Calculation of baseline emissions

Additional comment:	Number of persons supplied with purified water from each chlorine dispenser (POP_y) of Case 2 CPAs ~~(~~,i.e. CPA9 and CPA22, which~~)~~ should be checked annually and once every two years, respectively. For other CPAs which fall under Case 1, as per paragraph 3(a) in AMS-III.AV version 03, POP_y is an ex-ante determined value and does not need to be updated. However, to enhance the accuracy and completeness of the monitoring program, Evidence Action performed a population check survey and voluntarily updated the POPy of CPA2, 3, 10 and 21 as well as CPA9 and CPA22 in 2017. During the survey, the number of households that were using the dispensers for drinking water purification was identified. The household size was also updated based on most recent public data[12]. The number of households using each water point of each CPA was established as below: For CPA 2: POP_P = 40.4 households * 4.9 people/household = 198 For CPA 3: POP_P = 32.2 households * 4.9 people/household = 157 For CPA 9: POP_P = 36.3 households * 4.9 people/household = 178 For CPA 10: POP_P = 46.1 households * 4.9 people/household = 225 For CPA 21: POP_P = 44.8 households * 4.9 people/household = 219 For CPA 22: POP_P = 46.9 households * 4.9 people/household = 229 The updated POP_y for each CPA (CPA2, 3, 9, 10, 21 and 22) is considered conservative and therefore adopted during this monitoring period.

Data / Parameter:	**Monitoring parameters for the project emissions from fossil fuel combustion**
Unit:	-
Description:	Parameters to be monitored for the calculation of project emissions from fossil fuel combustion as per the tool
Measured/ Calculated/ Default:	-
Source of data:	-
Value(s) of monitored parameter:	No consumption of fossil fuel by chlorine dispensers.
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Used to quantify project emissions
Additional comment:	To be considered only in the case the water purification devices consumes fossil fuels.

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

[12] Uganda Household Survey 2016/2017, average household size for rural Uganda

Measured/ Calculated/ Default:	-
Source of data:	-
Value(s) of monitored parameter:	No consumption of electricity by chlorine dispensers.
Monitoring equipment:	-
Measuring/ Reading/ Recording frequency:	-
Calculation method (if applicable):	-
QA/QC procedures:	-
Purpose of data:	Used to quantify project emissions
Additional comment:	To be considered only in the case the water purification devices consumes electricity.

E.3. Implementation of sampling plan

>>

According to the registered CPA DDs, three parameters were quantified through surveys: Water quality, Drink% and Refill%. The single sampling design was implemented in line with the validated CPA DD Section D.7.2:

(i)Objectives and Reliablility Requirements

The objective was to obtain reliable and conservative estimates of the parameters listed in Section E obtained through surveys over the course of the monitoring period and meeting the indicated confidence/precision levels. The results were consolidated into one single value over the full monitoring period**.**

(ii)*Target Population*

The target population is the people with access to chlorine dispensers installed as a result of CPA 2, 3, 9, 10, 21 and 22 under the PoA. Each dispenser is assigned with a unique identification number of water point ID, which is part of the CPA dispenser database. Each end user is linked to a water point with a dispenser and each chlorine dispenser is assigned to a specific CPA. Surveys were conducted by Evidence Action field staff using mobile-based surveys.

(iii)*Sampling Method*

Grouping of CPAs was applied for this monitoring period (CPA 2, 3, 9, 10, 21 and 22). Clustered sampling was undertaken for the water quality and Drink% monitoring; during this monitoring period, water samples were collected from all the households who use the dispensers to purify their drinking water for the WQ test, and Drink% was surveyed from all the households who use the dispensers to purify their drinking water for the selected clusters.

Simple random sampling for Refill%. The sampling was done with randomly selected numbers corresponding to unique ID numbers of the dispensers.

*(iv)*Sample Size

A 95/10 confidence/precision requirement has to be fulfilled. The number of visited dispensers is line with sample approach.

(v)Sampling Frame

The sampling frame for CPA 2, 3, 9, 10, 21 and 22 consisted of all installed chlorine dispensers allocated to CPA 2, 3, 9, 10, 21 and 22, represented by their unique identification numbers stored in the chlorine dispenser database.

The following section describes the details of the implemented sampling design:

Water Quality& Drink%: the CPA 2, 3, 9, 10, 21 and 22 dispenser databases with all dispensers from dispenser databases. The field officers visit the households listed and test their drinking water quality.

Refill%: Randomly selected promoters were interviewed during the monitoring period.

The collected data were summarized and analysed in an Excel spreadsheet. It is concluded the 95/10 confidence/precision level was met.

In addition, to enhance the accuracy and completeness of the monitoring program, Evidence Action performed a population check survey and voluntarily updated the POP_y of CPA2, 3, 10 and 21 as well as CPA9 and CPA22 in 2017. The survey result of POP_y for each CPA (CPA2, 3, 9, 10, 21 and 22) is considered conservative and therefore adopted during this monitoring period. Please refer to Section E.2 for more details.

SECTION F. Calculation of emission reductions or net anthropogenic removals

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

>>

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

= *96,332 tCO_2e* [CPA 2]

= *66,137 tCO_2e* [CPA 3]

= *61,717~~74~~ tCO_2e* [CPA 9]

= *65,357 tCO_2e* [CPA 10]

= *39,484 tCO_2e* [CPA 21]

= *~~27,883~~26,039 tCO_2e* [CPA 22]

Where:

BE_y	Baseline emissions during the year *y* (tCO_2e)
QPW_y	Quantity of purified water in year *y* = 436,155,489 (cap) [CPA 2] = 301,934,315 (cap) [CPA 3] = ~~275,043,940~~274,789,741 (cap) [CPA 9] = 285,256,804 [CPA 10] = 167,875,681 [CPA 21] = ~~120,650,164~~112,669,141 (cap) [CPA 22]
SEC	Specific energy consumption required to boil one liter of water = 3,301 kJ/L [CPA 2], 3,274 [CPA 3], 3,357 [CPA 9], 3,424 [CPA 10], 3,515 [CPA 21], 3,454 [CPA 22] (SEC calculation below)
$f_{NRB,y}$	Fraction of non-renewable biomass

= 82% (default value for Uganda)

$EF_{projected\_fossilfuel}$ Emission factor
= 81.6 tCO_2/TJ (default value)

The specific energy consumption required to boil one liter of water was 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
= 4.186 kJ/L °C (default value)

T_f Final temperature
= 100 °C (default value)

T_i Initial temperature of water
= 20 °C (default value)

WHE Latent heat of water evaporation
= 2,260 kJ/L (default value)

η_{wb} Efficiency of the water boiling systems being replaced
= 10.83% [CPA 2], 10.92% [CPA 3], 10.65% [CPA 9], 10.44% [CPA 10] , 10.17% [CPA 21] and 10.35% [CPA 22] (baseline survey)

The water quality was monitored on sample basis for contamination with Escherichia coli (E. coli). A presence of up to 10 E. coli CFU/100 ml shall be acceptable. Only the fraction of water quality measurements providing water of sufficient quality (~~85.7%~~82.75%) needs be included from the calculation of emission reductions and BE_y was adjusted accordingly.

Consider the 2017 survey is not sufficient to cover the period from 20/10/2017 to 31/12/2017 of this monitoring period. Therefore, the CME will not claim the ERs generated from 20/10/2017 to 31/12/2017 (73-day) for both CPA-2/3, and an adjusting factor of 87.39%, i.e. (579-73)/579 is introduced for CPA 2/3 to fulfil the monitoring validity.

CPA 9/10 were only included into the PoA on 13/09/2016 and this is the first monitoring period for CPA 9/10. The survey conducted in 2017 is considered only valid for one-year period (01/01/2017 to 31/12/2017) as per the monitoring requirment, and is not sufficient to cover the whole monitoring period (13/09/2016 to 31/12/2016). Therefore, the CME will not claim the ERs generated from 13/09/2016 to 31/12/2016 (110-day) for both CPA 9/10, and an adjusting factor of 76.84%, i.e. (475-110)/475 is introduced for CPA 9/10 to fulfil the monitoring validity.
~~For CPA-9/10, the survey conducted since 19/10/2017 is valid for one-year period (20/10/2016 to 19/10/2017) as per the monitoring requirment, and is not sufficient to cover the whole monitoring period (01/06/2016 to 31/12/2017). Therefore, the CME will not claim the ERs generated from 13/09/2016 to 19/10/2016 (37-day) for both CPA-9 and CPA-10, and an adjusting factor of 92.21% (i.e. 438/475) is introduced for CPA 9 and 10 to fulfil the monitoring validity.~~

*96,332 tCO_2e * ~~85.7%~~82.75%~~* 87.39%~~ = ~~82,556~~79,714~~69,664~~ tCO2e [CPA 2]*

*66,137 tCO_2e * ~~85.7%~~82.75% ~~* 87.39%~~= ~~56,679~~54,728~~47,828~~ tCO_2e [CPA 3]*

*61,7~~17~~74 tCO_2e * ~~85.7%~~82.75% ~~* 92.21~~76.84% = ~~52,940~~47,092~~39,244~~ tCO_2e [CPA 9]*

*65,357 tCO_2e * ~~85.7%~~82.75%~~* 92.2~~76.84~~1~~% = ~~56,010~~49,870~~41,558~~ tCO_2e [CPA 10]*

*39,484 tCO_2e * ~~85.7%~~82.75% = ~~33,837~~32,673~~ tCO_2e [CPA 21]*

*26,039 tCO_2e * ~~85.7%~~82.75% = ~~23,895~~21,547 tCO_2e [CPA 22]*

(3)

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

>>

The operation of the chlorine dispensers does not involve the consumption of fossil fuels or electricity. Therefore, the project emissions are zero.

F.3. Calculation of 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 of the project is:

LE =

*~~82,556~~79,714~~69,664~~ tCO_2e * (1- 0.95) = ~~4,128~~3,986~~3,484~~ tCO_2e* [CPA 2] **(4)**

*~~56,679~~54,728~~47,828~~ tCO_2e * (1- 0.95) = ~~2,834~~2,737~~2,392~~ tCO_2e* [CPA 3]

*~~52,940~~47,092~~39,244~~ tCO_2e * (1- 0.95) = ~~2,647~~2,355~~1,963~~ tCO_2e* [CPA 9]

*~~56,010~~49,870~~41,558~~ tCO_2e * (1- 0.95) = ~~2,801~~2,494~~2,078~~ tCO_2e* [CPA 10]

*~~33,837~~32,673 tCO_2e * (1- 0.95) = ~~1,692~~1,634 tCO_2e* [CPA 21]

*~~23,895~~21,547 tCO_2e * (1- 0.95) = ~~1,195~~1,078 tCO_2e* [CPA 22]

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

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
5962-0001	0	0	0	0	0	0
5962-0002	~~82,556~~79,714 69,664	0	~~4,128~~3,986~~3,4~~ 84	0	~~78,428~~75,728 66,180	~~78,428~~75,728 66,180
5962-0003	~~56,679~~54,728 47,828	0	~~2,834~~2,737~~2,3~~ 92	0	~~53,845~~51,991 45,436	~~53,845~~51,991 45,436
5962-0008	~~52,940~~47,092 39,244	0	~~2,647~~2,355~~1,9~~ 63	0	~~50,293~~44,737 37,281	~~50,293~~44,737 37,281
5962-0009	~~56,010~~49,870 41,558	0	~~2,801~~2,494~~2,0~~ 78	0	~~53,209~~47,376 39,480	~~53,209~~47,376 39,480
5962-0017	~~33,837~~32,673	0	~~1,692~~1,634	0	~~32,145~~31,039	~~32,145~~31,039
5962-0018	~~23,895~~21,547	0	~~1,195~~1,078	0	~~22,700~~20,469	~~22,700~~20,469
Total	**~~252,514~~305,9 ~~17~~285,624**	**0**	**~~12,629~~15,297 ~~14,284~~**	**0**	**~~290,620~~271,3 ~~40~~239,885**	**~~290,620~~271,3 ~~40~~239,885**

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

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
5962-0001	0	0
5962-0002	~~78,428~~~~75,728~~66,180	94,006
5962-0003	~~53,845~~~~51,991~~45,436	70,974
5962-0008	~~50,293~~~~44,737~~37,281	77,586
5962-0009	~~53,209~~~~47,376~~39,480	74,817
5962-0017	~~32,145~~31,039	54,464
5962-0018	~~22,700~~20,469	54,749
Total	**~~290,620~~~~271,340~~239,885**	**426,597**

F.6. Remarks on increase in achieved emission reductions

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As the start date of CPA 1 is still pending no CERs are claimed for this monitoring period.

During the monitoring period, the measured emission reductions of CPA 2, 3, 9, 10, 21 and 22 are lower than the estimated emission reductions in the CPA-DDs.

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Document information

Version	*Date*	*Description*
02.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
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