CLEAN DEVELOPMENT MECHANISM

AMS-III.AV.

Small-scale Methodology

Low greenhouse gas-emitting safe drinking water production systems

Version 08.0

Sectoral scope(s): 03

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical project(s)	Project activities that introduce low GHG emitting water purification systems to provide safe drinking water and displace water boiling using non-renewable biomass or fossil fuels
Type of GHG emissions mitigation action	Displacement of a more-GHG-intensive output

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises introduction of low greenhouse gas emitting water purification systems to provide safe drinking water (SDW). Water purification technologies that involve point-of use (POU) or point-of-entry (POE)[1] treatment systems for residential or institutional applications such as systems installed at a school or a community centre are included. The examples include, but are not limited to, water filters (e.g. membrane, activated carbon, ceramic filters), solar energy powered ultraviolet (UV) disinfection devices, solar disinfection techniques, photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (e.g. chlorination), combined treatment approaches (e.g. flocculation plus disinfection). The methodology is also applicable to water kiosks[2] that treat water using one or more of the following technologies: chlorination, combined flocculant/disinfection powders and solar disinfection.[3] In case the water kiosk is using solar disinfection, project proponents need to implement measures to prevent recontamination (e.g. disinfecting containers, sealing containers and hygiene training).

3. Soil filtration schemes (boreholes, wells) that include container disinfection (e.g. chlorination) may be applied. Project proponents shall demonstrate ex ante that rehabilitation and/or construction of the wells complies with relevant national and/or international standards and that measures are taken to ensure that water and well are not contaminated.

[1] Please refer to the definition of Point of Use (POU)/ Point of entry (POE) in section 4.

[2] Please refer to the definition of water kiosk in section 4.

[3] According to "A toolkit for monitoring and evaluating household water treatment and safe storage programmes" (WHO – 2012) – Annex A - Summary of HWTS methods, the use of these technologies can provide protection against recontamination.

2.2. Applicability

4. This methodology is applicable under the following conditions:

(a) Prior to the implementation of the project activity, a public distribution network supplying SDW to the project boundary does not exist;[4]

(b) It shall be demonstrated based on laboratory testing[5] or official notifications (for example notifications from the national authority on health) that the application of the project technology/equipment achieves compliance either with: (i) the *Comprehensive Protection* performance target as per "Evaluating household water treatment options: Health based targets and microbiological performance specifications" (WHO, 2011) and "International Scheme to Evaluate Household Water Treatment Technologies" (WHO, 2014); or (ii) an applicable national standard or guideline. Applicable national standard should be based on laboratory efficacy testing that, at a minimum, includes quantitative microbial measures of pre- and post-treatment challenge waters[6] that are representative of potential drinking water sources, and that includes measured reductions based on at least one pathogen class (bacteria, viruses, protozoa).

Box 1. Non-binding best practice example 1: Applicable national standards or guidelines for technology testing

National guidelines for technology testing, often referred to as Environmental Technology Verification (ETV) programs, are intended to test the performance of treatment technologies via spiked challenge water testing to derive microbial reductions across a range of conditions. The defining characteristic of such testing is measurement of pre-treatment and post-treatment waters, using high microbial counts (e.g., >6 $\log_{10}$) in pre-treatment waters. Ideally, ETV programs should assess efficacy of technologies across multiple pathogen classes (bacteria, viruses, protozoa) and multiple challenge waters (e.g., spiked groundwater and/or surface water) representing a range of physical-chemical characteristics that may be expected in pre-treatment drinking water in the intended application context.

The minimum criteria should be:

1. Structured comparison of microbial counts in pre- and post-treatment water for at least one pathogen class;
2. That these reductions are derived from spiked, challenge water testing; and
3. That these reductions are verified under controlled laboratory conditions for waters representative of potential drinking water sources where technologies are intended for use.

(c) In cases where the life span[7] of the water treatment technologies is shorter than the crediting period of the project activity, there shall be documented measures in

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[4] This methodology is also applicable in case a public distribution network exists, but is not supplying SDW.

[5] The testing should be undertaken under conditions that are representative of the operation conditions of the project site(s) including feedwater.

[6] "Challenge water" is synonymous with "test water" – this is the experimental water that has been spiked with microbes (a "microbial challenge") in order to demonstrate the potential for the technology to reduce microbes.

[7] The rated average life of each system type shall be known ex ante using manufacturer specifications and documented in the PDD/PoA-DD.

place to ensure that end users have access to replacement purification systems of comparable quality;

(d) It should be demonstrated that the project appliances use technologies that meet the technology standards as per paragraph 4(b), and that they deliver microbiologically safe drinking water.

2.3. Entry into force

5. The date of entry into force is the date of the publication of the EB 106 meeting report on 12 June 2020.

2.4. Applicability of sectoral scopes

6. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of sectoral scope 03 is mandatory.

3. Normative references

7. Project participants shall apply the "General guidelines for SSC CDM methodologies" and the tools "Demonstration of additionality of small-scale project activities" and "Demonstration of additionality of microscale project activities" and "Leakage in biomass small-scale project activities" provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> mutatis mutandis.

8. This methodology also refers to the latest approved versions of the following methodologies and tools:

(a) "AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user";

(b) Standard for "Sampling and surveys for CDM project activities and programme of activities";

(c) "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

(d) "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation";

(e) "TOOL30: Calculation of the fraction of non-renewable biomass".

4. Definitions

9. The definitions contained in the Glossary of CDM terms shall apply.

10. For the purpose of this methodology, the following definitions apply:

(a) **Point of Use (POU)** - devices treat only the water intended for direct consumption, typically at a single tap or limited number of taps, while Point of Entry (POE) treatment devices are typically installed to treat all water entering a single home, business, school, or facility (USEPA, 2006);

(b) **Distribution network** - it is a public service which is provided by government to people living within its jurisdiction, either directly or through an authorized party;

(c) **Water kiosk -** it is a facility to treat water to be delivered or sold to final consumers in appropriate conditions of sealed storage and/or residual capacity of disinfection, in such a way as to prevent recontamination before the final consumption as drinking water.

5. Baseline methodology

5.1. Project boundary

11. The project boundary includes the physical, geographical sites of the low greenhouse gas emitting technologies for water purification installed by the project activity and the household/institutional buildings where the consumers of safe water provided by the systems are located.

5.2. Identification of the baseline scenario and demonstration of additionality

12. The additionality of a project activity shall be demonstrated, according to the Methodological TOOL 01 “Tool for the demonstration and assessment of additionality” or Methodological TOOL 21: “Demonstration of additionality of small-scale project activities” or the Methodological TOOL 19: “Demonstration of additionality of microscale project activities”.

13. It is assumed that fossil fuel and/or non-renewable biomass (NRB) is used to boil water as means of water purification in the absence of the project activity.

5.3. Baseline emissions

14. The emissions are calculated based on the energy demand for boiling water, and in case of displacement of NRB the baseline emissions are corrected for the fraction of the biomass that can be demonstrated to be non-renewable. Only purified water consumed for drinking purposes can be used in the baseline calculation.

15. The baseline emissions shall be calculated as follows:

$$BE_y = QPW_y \times m \times X_{boil} \times SEC \times \sum_i \left(BL_{fuel,i} \times f_i \times EF_{projected\_fossil\,fuel,i} \times 10^{-9}\right) \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions during the year *y* in (t CO_2e)
QPW_y	=	Total quantity of water purified by the project in year *y* (L)
m	=	Fraction of functional appliances that are providing the SDW (%). Only project appliances that (i) use technologies that meet the technology standards as per paragraph 4(b) and (ii) are operating or replaced by an equivalent in service appliance and (iii) deliver microbiologically safe drinking water, are counted for emission reductions

X_{boil}	=	Fraction of the population served by the project activity for which the common practice of water treatment is or would have been water boiling. It is determined ex ante through surveys
SEC	=	Specific energy consumption required to boil one litre of water (kJ/L), to be calculated according to paragraphs below
$BL_{fuel,i}$	=	Proportions of baseline fuel type *i* (NRB and/or fossil fuels) used in the absence of the project activity (fraction)
f_i	=	Fraction of non-renewable fuel type *i* used in the absence of the project activity in year *y*. For biomass, it is the fraction of woody biomass that can be established as non-renewable biomass (f_{NRB}). If the baseline fuel is fossil fuel, the value to be applied is 1
$EF_{projected\_fossil\,fuel,i}$	=	Emission factor of the fuel type *i* substituted (t CO_2/TJ)

16. The quantity of purified water in a year is:

    (a) Option 1: Directly monitored; or

    (b) Option 2: Indirectly monitored following the procedures described in paragraph below.

17. For Option 2, the quantity of purified water should be monitored and calculated based on the following options:

    (a) Option 2.1: The capacity of the equipment based on the manufacturers' specifications, and the usage time of the equipment, as follows:

$$QPW_y = \sum q_{,i} \times t \quad \text{Equation (2)}$$

Where:

$q_{,i}$	=	Capacity of the water purification device (L/hour) provided by the manufacturer
t	=	Usage time (hours/year)

    (b) Option 2.2: The population serviced by the project activity and an average volume of drinking water per person per day, as follows:

$$QPWy = P_y \times min\,(QPWpp\,;\, 5.5\,) \times 365 \quad \text{Equation (3)}$$

Where:

P_y	=	Population who consumes the purified water serviced by the project activity in year *y*
$QPWpp$	=	Average volume of drinking water per person per day (L/person/day) determined ex ante of the crediting period through a baseline survey

18. The quantity of purified water, whether it is directly or indirectly monitored and calculated, respectively, is subject to a cap that must be established based on the population (P) serviced by the project activity and the maximum quantity of drinking water per person per day of 5.5 L/person/day[8]. If the quantity of purified water by the project activity exceeds the established cap, emission reductions cannot be claimed for the quantity of purified water above the established cap.

19. Specific energy consumption required to boil one litre of water is to be calculated as follows:

$$SEC = \left[WH \times \left(T_f - T_i\right) + 0.01 \times WHE\right] / \eta_{wb} \quad \text{Equation (4)}$$

Where:

WH	=	Specific heat of water (kJ/L ºC). Use a default value of 4.186 kJ/L ºC
T_f	=	Final temperature (ºC). Use a default value of 100 °C[9]
T_i	=	Initial temperature of water (°C). Use annual average ambient temperature;[10] or use a default value of 20 °C
WHE	=	Latent heat of water evaporation (kJ/L). Use a default value of 2260 kJ/L. The latent heat required to boil one litre 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)[11]
η_{wb}	=	Efficiency of the water boiling systems being replaced, estimated ex ante. Default values in Data / Parameter table 3 may be used

20. Alternatively, if default values of the parameters are applicable to Equation (4) above, *SEC* can be calculated as follows:

$$SEC = [357.48\ kJ/L] / n_{wb} \quad \text{Equation (5)}$$

5.4. Leakage

21. Where relevant leakage relating to the non-renewable woody biomass shall be assessed as per the relevant procedures of AMS-I.E.

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[8] Based on WHO recommendations (Domestic Water Quantity, Service Level and Health, Table 2: Volumes of water required for hydration, WHO 2003).

[9] Boiling point of water at standard conditions.

[10] Ambient temperature data must be from globally accepted data sources, for example data published by the National Aeronautics and Space Administration (NASA) or the National Renewable Energy Laboratory (NREL). Data can be used only if they are for a location that can be demonstrated to be representative of the project location.

[11] WHO guidelines for emergency treatment of drinking water at point of the use <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.

5.5. Project activity emissions

22. If the operation of the project water purification system involves consumption of fossil fuels and/or electricity, CO_2 emissions from on-site consumption of fossil fuels and electricity due to the project activity shall be accounted for as project emissions.[12]

$$PE_y = PE_{FF,y} + PE_{EC,y} \quad \text{Equation (6)}$$

5.5.1. Emissions from fossil fuel combustion (*$PE_{FF,y}$*)

23. $PE_{FF,y}$ shall be calculated using the latest version of the “TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”. To estimate the amount of fuel consumption of water purification systems, the manufacturer’s specification of the equipment (e.g. fuel consumption per hour times utilization hours or fuel consumption per litre times the litres of water treated) may be used.

5.5.2. Emissions from electricity consumption (*$PE_{EC,y}$*)

24. $PE_{EC,y}$ shall be calculated using the latest version of “TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”. To estimate the amount of electricity consumption of water purification systems, the manufacturer’s specification of the equipment (e.g. electricity consumption per hour times utilization hours or electricity consumption per litre times the litres of water treated) may be used.

5.6. Emission reductions

25. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \text{Equation (7)}$$

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
PE_y	=	Project emissions in year *y* (t CO_2e/yr)
LE_y	=	Leakage emissions in year *y* (t CO_2e/yr)

5.7. Project activity under a programme of activities

26. The use of this methodology in a project activity under a programme of activities is legitimate if the leakage is estimated and accounted for as per the relevant provisions of AMS-I.E. under the section for programme of activities.

[12] Calculations of the project emissions may also be limited to the quantity of purified water used for the baseline calculations as per paragraph 14.

5.8. Data and parameters not monitored

27. In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data / Parameter table 1.

Data / Parameter:	QPW_{pp}
Data unit:	Litres
Description:	Average volume of drinking water per person per day
Source of data:	Estimated through ex ante survey or official data, or peer reviewed literature or local expert opinion. Alternatively, a default value of 3 litres per person per day[13] can be used. The maximum value of 5.5 litres per person per day shall not be exceeded
Value to be applied:	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	LS
Data unit:	Years
Description:	Life span of water treatment technologies
Source of data:	Manufacturer’s specifications
Value to be applied:	-
Any comment:	In cases where the life span of the water treatment technologies is shorter than the crediting period of the project activity, the project proponent shall ensure that the units are replaced in order to continue claiming emission reductions. There shall be measures in place to ensure that end users have access to replacement purification systems of comparable quality. These measures shall be documented in the PDD or PoA-DD

Data / Parameter table 3.

Data / Parameter:	η_{wb}
Data unit:	%
Description:	Efficiency of the water boiling systems being replaced
Source of data:	Project activity site

[13] Based on WHO recommendations (Technical Notes on Drinking Water, Sanitation and Hygiene in Emergencies, Table 9.1: Simplified table of water requirements for survival (per person).

Value to be applied:	Use one of the options below: (a) 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 system is encountered; (b) 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 that is 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; (c) 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
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$BL_{fuel,i}$
Data unit:	Fraction
Description:	Proportions of baseline fuel type *i* (NRB and fossil fuel)
Source of data:	Estimated ex ante through a survey or official data or peer reviewed literature or local expert opinion
Value to be applied:	-
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	f_i
Data unit:	fraction
Description:	Factor to determine amount of non-renewable fuels
Source of data:	Project activity site
Value to be applied:	Fraction of fuel type *i* used in the absence of the project activity in year *y*. For biomass, it is the fraction of woody biomass that can be established as non-renewable biomass (fNRB) as per “TOOL30: Calculation of the fraction of non-renewable biomass”.[14] If the baseline fuel is fossil fuel use a default value of 1.0
Any comment:	-

[14] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/methodologies/standard_base/index.html>.

Data / Parameter table 6.

Data / Parameter:	$EF_{projected\_fossil\ fuel,i}$
Data unit:	t CO_2/TJ
Description:	Emission factor of the fuel(s) type *i* substituted
Source of data:	Project activity site
Value to be applied:	- If the fuel displaced is NRB, this parameter can be sourced from approved methodology AMS-I.E. (i.e. Table 2 in version 10.0 of AMS-I.E., if there are updates use the information from the latest version of AMS-I.E.); - If the fuel displaced is fossil fuel, apply the emission factor of the fossil fuel
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	X_{boil}
Data unit:	%
Description:	Fraction of the population serviced by the project activity for which the common practice of water purification is or would have been water boiling
Source of data:	Established ex ante through survey
Value to be applied:	-
Any comment:	

Data / Parameter table 8.

Data / Parameter:	$q_{,i}$
Data unit:	Litres/hour
Description:	Capacity of the equipment type *i*
Source of data:	Project activity site
Value to be applied:	-
Any comment:	Based on the manufacturers' specifications

6. Monitoring methodology

28. All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred per cent of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

29. In addition, the monitoring provisions in the tools referred to in this methodology apply.

6.1. Data and parameters monitored

Data / Parameter table 9.

Data / Parameter:	P_y
Data unit:	Number
Description:	Population who consumes the purified water serviced by the project activity in year *y*
Source of data:	Survey records
Measurement procedures (if any):	A survey shall be conducted annually to check the number of persons who consume the purified water supplied by functional project appliances
Monitoring frequency:	Annual
QA/QC procedure	-
Any comment:	-

Data / Parameter table 10.

Data / Parameter:	QPW_y
Data unit:	Litres
Description:	Quantity of purified water in year *y*
Source of data	Records
Measurement procedures (if any):	The quantity of purified water in year *y* shall be determined: (a) For distributed appliances, as per the following options: • Monitoring on continuous basis using flow meter(s) for a statistically valid sample of the distributed appliances, or • Monitoring of a statistically valid sample of the distributed appliances during a period that is representative of the monitoring period. (b) For water kiosks, as per the following options: • Monitoring on continuous basis using flow meter(s), or • Monitoring on continuous basis using a standard vessel. Alternatively, this parameter can be calculated, based on either Equation (2) or Equation (3) above
Monitoring frequency:	Annual
QA/QC procedure	For monitoring using a standard vessel, the volume of water shall be cross-checked against water sales receipts.
Any comment:	For (a) and (b), the sample size shall be determined as per the latest version of the “Standard: Sampling and surveys for CDM project activities and programme of activities”[15]. For projects implemented in water kiosks where the quantity of purified water is measured using a standard vessel, measures are implemented to ensure that there is no contamination of water during the measurement process

[15] <https://cdm.unfccc.int/Reference/Standards/index.html>.

Box 2. Non-binding best practice example 2: Monitoring of quantity of purified water

> To monitor the quantity of purified water, sample-based measurement using a volumetric container can be conducted as follows:
> For example, the water purifier has a capacity of 23 litres storage. At the time of surveying, the device is filled to its maximum capacity at the beginning of the day. At the end of the day, the left-over water is measured using a simple volumetric container and the difference is taken as the water consumed per day. This value is divided by the total number of members in the household to estimate the value for the parameter. It is ensured that the survey is not done on a day when the water consumption is higher than normal days hence, weekends and festive days are avoided.

Data / Parameter table 11.

Data / Parameter:	***m***
Data unit:	fraction
Description:	Fraction of functional appliances that are providing the SDW
Source of data	Surveys and microbiological testing
Measurement procedures (if any):	This parameter shall be determined through checking all appliances or a statistically representative sample of the appliances to ensure the following conditions that: (a) they only use technologies that are meeting the SDW technology standards as per paragraph 4(b); (b) they are still operating or are replaced by an equivalent in-service appliance. The use of appliances shall be monitored through self-report measures (survey data from respondents) as well as physical signs that are observable (e.g. wetness of the unit, water in storage receptacle, functionality of parts) as per “Objective measures of functionality and use of project appliances” described in the Appendix. (c) they are delivering microbiologically safe drinking water. Appliances shall deliver treated water verified to be <1 cfu / 100 ml *E. coli*, using methods for measurement with a lower detection limit (LDL) of 1 cfu *E. coli* per 100 ml sample (See Box 3 below). Emission reductions cannot be claimed if over 10% of appliances in the project activity fail to meet the final water quality requirements mentioned above
Monitoring frequency:	Annually
QA/QC procedure	The sampling plan shall also include provisions to collect information for records of replacement of appliances, filters and maintenance
Any comment:	A statistically valid sample of the appliances can be used to determine the parameter value, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters

Box 3. Non-binding best practice example 3: Monitoring water quality using standard E. coli tests

Representative sampling of finished (post-treatment) drinking water is required to ensure that applicable safety standards are met; all treatment devices should be required to meet potable water standards to be eligible. Monitoring researchers have determined that only in limited cases local laboratories exist that can examine the large number of samples that must be taken and measured. Therefore, low-cost testing kits may be considered for use by the monitoring team. If the locally applicable standard is non-detect of *E. coli* in 100 ml samples, the required detection limit for any applicable assay should be 1 *E. coli* per 100 ml, meaning that the test must be able to distinguish between 0.0 *E. coli* per 100 ml and 1.0 *E. coli* per 100 ml. This means that the assay volume should be 100 ml or greater, and the sensitivity of the test should be able to yield a quantal or quantitative signal in the presence of 1 colony-forming unit (cfu) of *E. coli*, objectively indicated. Tests that use less than 100 ml sample volume, tests that are not specific to the target indicator microbe, or tests that are based on indirect detection of the target microbe should not be acceptable in monitoring programs. Generally speaking, standard tests from international suppliers that use chromogenic media for cell culture based on 100 ml sample volumes should meet this requirement, provided they are specific to *E. coli* and the tests are done according to standard protocols.

Data / Parameter table 12.

Data / Parameter:	***t***
Data unit:	Hours/year
Description:	Usage time
Source of data	Surveys
Measurement procedures (if any):	Ex post monitoring survey to establish the usage time when the water purification device is functional
Monitoring frequency:	Annual
QA/QC procedure	-
Any comment:	A statistically valid sample can be used to determine parameter values, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters

Data / Parameter table 13.

Data / Parameter:	**Check for SDW public distribution network**
Data unit:	-
Description:	Annual check if there is a public distribution network supplying SDW is installed
Source of data	Surveys (for example, this may be checked through a signed questionnaire/statement from relevant local authority/organizations based on laboratory testing or end-user surveys.)
Measurement procedures (if any):	Monitoring shall include annual check if there is public distribution network supplying SDW
Monitoring frequency:	Annual
QA/QC procedure	-

Any comment:	If SDW is made available through a public distribution network during the crediting period, the emission reductions pertaining to the households/buildings supplied by the public system cannot be claimed from that point onwards. This condition should be checked annually during the crediting period

Data / Parameter table 14.

Data / Parameter:	**Quality of safe drinking water**
Data unit:	-
Description:	The quality of the safe drinking water
Source of data	Project activity site
Measurement procedures (if any):	The safe drinking water quality is monitored on sample basis at least once every two years (biennial)
Monitoring frequency:	At least once every two years
QA/QC procedure	-
Any comment:	Emission reductions cannot be claimed if project activity fails to meet SDW standards as per paragraph 4(b)

Appendix. Objective measures of functionality and use of project appliances

1. The table below describes usage metrics as examples of objectively measurable quantities for estimating usage during project monitoring.

Table. Usage metrics for objective measures of functionality and use of project appliances

Technology type	Proposed usage metric(s)	Comments	Requirements
Filtration: membrane	Surface fouling or membrane wear	Membranes wear and foul over time with use. Such changes to membranes are directly observable; these measures can be validated over time for a given membrane and used to develop an estimate of total volume throughput.	Micrometer, handheld microscope
Filtration: ceramic or block	Filter surface erosion	Ceramic or block filters (and similar filters with solid surfaces) degrade over time through use and through maintenance by users, who may be required to scrub or abrade the active surfaces to restore flow rates. Filter thickness or wear at surfaces can be developed as an indicator of flow over time and therefore use.	Micrometer, handheld microscope
Disinfection: ultraviolet	Lamp or bulb intensity	UV intensity of lamps degrade over time with use, and, if measured over time and validated for that specific lamp, can provide an estimate of total time in use, which can then be used to estimate the total volume treated.	Handheld UV light meter
Disinfection: chlorine, bromine, iodine, or similar compounds	Disinfectant residual testing	Chemical disinfection results in dissolved disinfectants that are readily measurable. For chlorine containing compounds, free Chlorine and total chlorine provide readily measurable quantities indicating recent past use of chlorination.	Handheld colorimetric free chlorine and total chlorine tests, either as pool test kits or meters
Disinfection: thermal	pH and dissolved oxygen	Heat treatment of water, including boiling, removes dissolved O_2 and CO_2, reduces chemical species, and results in changes to pH and dissolved oxygen, both of which can be locally validated and used to verify whether water has been recently boiled. These measures need further characterization and local validation around the longevity and reliability of effects but hold great promise especially where a control sample of unboiled water is available for examination.	Handheld pH and/or DO meter
Disinfection: metals	Metal ions	Metal ion disinfection, primarily silver and copper compounds or nano particles, will be present in treated water at low but measurable concentrations. Residuals indicating treatment can be measured as objective use indicators.	Hach colorimetric testing kit for metal ion analysis

Box 4. Non-binding best practice example 4: Validating objective measures for use in monitoring

Figure 1. Filter thickness as empirically derived indicator of use (example)

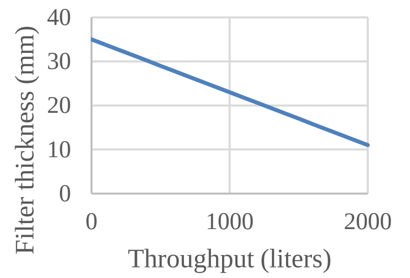

Table above presents a number of potential objective measures for use in ongoing monitoring of safe water programs.

The simplest of these would apply for chlorine-based disinfection, where verification of treatment would involve measurement of chlorine residual (free chlorine and total chlorine) via colorimetric measurement. Such measures unambiguously indicate recent treatment using this mechanism of microbial inactivation.

Filter-based technologies are less straightforward for measurement, given the potential that treated water contains no measurable quantity that is an objective indicator of use. Depending on the filter material, a relationship between volumetric flow rate or time in use and filter wear may be established in advance (See figure 1 for example) and applied to verify use in the field for monitoring purposes. Take the example of ceramic water filters, whose surface is abraded over time as the filter is cleaned during regular use. For such technologies, regular use results in a lessening of the thickness of the filter over time, primarily correlated with the regular required cleaning.

Membrane wear can be measured as an indicator of water treatment technology usage, in a similar manner to that for ceramic filters. In this method, a non-destructive, real-time method for assessing wear could be mobile phone photomicrography: the use of mobile phone cameras to capture images of membrane surfaces for assessment of wear. Like for ceramic filtration, such measures should be based on an empirical assessment of membranes over the functional life of the treatment technology and identification of wear indicators that correlate with use.

Box 5. Non-binding best practice example 5: monitoring usage of a multi-barrier POU device

POU devices often include more than one active mechanism for microbial reduction. Consider the example of a device incorporating ceramic filtration, activated carbon filtration, and disinfection via sodium dichloroisocyanurate (NaDCC) tablets in a controlled-release unit. Following testing and confirmation of meeting “Comprehensive protection: high pathogen removal” tier of the WHO’s International Scheme to Evaluate Household Water Treatment Technologies, this technology may be recommended for use in a safe water program, subject to ongoing monitoring and verification. Systematic, statistically representative water quality measurement for confirmation of use may be total chlorine in treated water samples and verification that treated water meets safe water requirements (typically non-detect of *E. coli* in 100 ml samples of treated water). In representative sampling, it is found that 8% of units fail to comply with the final water quality requirements. Therefore, emission reductions are adjusted to 92% of the calculated value.

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Document information

Version	*Date*	*Description*
08.0	12 June 2020	EB 106, Annex 10 Revision to update data and parameter tables.
07.0	28 March 2019	EB 102, Annex 9 Revision to improve requirements for demonstration of additionality.
06.0	31 August 2018	EB 100, Annex 9 Revision to: • Update the eligible technologies as per the recommendations contained in the relevant guidelines published by the World Health Organization (WHO); • Elaborate monitoring procedures for different types of technologies/measures; • Clarify the monitoring requirements related to SSC_702 for soil filtration technologies; • Ensure consistency with AM0086 for additionality provisions; • Expand applicability by allowing the situation where there is a public distribution network but is not supplying safe drinking water; • Include non-binding best practice examples to enhance the understanding of the requirements in the methodology.
05.0	24 July 2015	EB 85, Annex 15 Revision to: • Provide more specific guidance in applying the methodology including the calculation of baseline emissions to enable a standardized approach; and • Provide simplified and flexible monitoring procedures to reduce transaction costs without compromising environmental integrity.
04.0	31 May 2013	EB 73, Annex 12 The revision: Broadens the applicability of the methodology to water kiosks that treat water using one or more of the following technologies: chlorination, combined flocculant/disinfection powders and solar disinfection.
03.0	13 September 2012	EB 69, Annex 22 The revision: Includes project technologies that comply with WHO's Interim performance target on household water treatment or applicable national standards/guidelines.

Version	*Date*	*Description*
02.0	15 July 2011	EB 62, Annex 1 The revision: • Includes guidance on the procedures for project equipment testing and monitoring provisions; • Increases the threshold of rural or urban population with access to improved drinking source to 60 per cent; and • Applies a cap of 5.5 litres per person per day to all project activities.
01.0	15 April 2011	EB 60, Annex 19 Initial adoption.

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