CLEAN DEVELOPMENT MECHANISM

AM0086

Large-scale Methodology

Distribution of low greenhouse gas emitting water purification systems for safe drinking water

Version 05.0

Sectoral scope(s): 03

United Nations
Framework Convention on
Climate Change

TABLE OF CONTENTS Page

1. Introduction

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

Table 1. Methodology key elements

Typical projects	Low greenhouse gas (GHG) emitting water purification systems are distributed to consumers to provide safe drinking water
Type of GHG emissions mitigation action	Energy efficiency. Displacement of more GHG intensive technologies to provide safe drinking water

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology is applicable to project activities that distribute low GHG emitting water purification systems to provide safe drinking water (SDW), including point-of-use treatment systems for residential or institutional applications such as systems installed at a water kiosk, a school or a community centre. The examples include, but are not limited to, water filters (e.g. membrane, activated carbon, ceramic filters), solar energy powered ultraviolet disinfection devices, solar disinfection techniques, photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (e.g. chlorination), combined treatment approaches (e.g. flocculation plus disinfection).

3. The project participants either: (a) purchase the low GHG emitting water purification systems from a manufacturer and only arrange for their sale or distribution in the host country; or (b) both manufacture and sell or distribute the low GHG emitting water purification systems. The consumers of the water purification systems distributed or sold under the project activity are not the project participants.

4. 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.

5. A project activity implementation plan which specifies how the project is implemented should be established and documented in the CDM-PDD, including, inter alia, information on:

    (a) The type of water purification systems that are distributed or sold by the project participants, including information on the manufacturer, any label, the life span, technology, capacity, etc.;

    (b) The total number of water purification systems by type that are planned to be distributed by the project activity over each year of the first crediting period;

    (c) Conditions under which users are eligible to participate in the project activity (e.g. households with a certain income, etc.);

    (d) How the water purification systems will be distributed or sold to consumers.

2.2. Applicability

6. The methodology is applicable under the following conditions:

   (a) Prior to the implementation of the project activity, no public distribution network supplying SDW exists within the project boundary[1] . If during the crediting period SDW is made available through a public distribution network, the emission reductions pertaining to the households/institutions supplied by the public system cannot be claimed from that point onwards. This condition should be checked annually during the crediting period;

   (b) It shall be demonstrated based on laboratory testing or official notifications (for example notifications from the national authority on health) that the application of the project technology/equipment achieves compliance with either: (i) any of the *Comprehensive Protection* performance targets as per World Health Organisation (WHO) specifications[2] 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[3] that are representative of potential drinking water sources, and that includes measured reductions based on at least one pathogen class (bacteria, viruses, protozoa).;

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

[2] "Evaluating household water treatment options: Health based targets and microbiological performance specifications", WHO, 2011 <http://www.who.int/water_sanitation_health/publications/2011/evaluating_water_treatment.pdf>.

[3] "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.

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) Emission reductions pertaining to the use of a replacement water purification system can be claimed only if there are documented measures in place by the project proponent to ensure that end users have access to replacement purification systems of comparable quality;

(d) Only for water purifiers sold or distributed within the first crediting period are eligible for claiming emissions reductions;

(e) The project participants shall implement a management system to coordinate the distribution and to ensure the installation of the low GHG emitting water purification systems to the consumers. A contractual agreement with manufacturers, intermediary distributors and consumers and unique project identification of the systems shall ensure that there is no double counting of emission reductions;

(f) It should be demonstrated that the project appliances use approved technologies that are meeting the technology standards as per paragraph 6 (b), and that they deliver microbiologically safe drinking water.

7. In addition, the applicability conditions included in the tools referred to shall apply.

2.3. Entry into force

8. The date of entry into force is the date of the publication of the EB 102 meeting report on 28 March 2019.

2.4. Applicability of sectoral scopes

9. 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

10. This baseline and monitoring methodology is based on the following approved baseline and monitoring methodologies and proposed new methodologies:

    (a) "NM0280: Installation of zero-energy water purifier in India" prepared by Hindustan Unilever Limited & their Associate Consultants;

    (b) "AM0046: Distribution of efficient light bulbs to households" prepared by Perspectives Climate Change GmbH, Hamburg, Germany;

    (c) “AMS-III.AV: Low greenhouse gas emitting safe drinking water production systems”.

11. This methodology also refers to the latest approved versions of the following tools:

    (a) “TOOL01: Tool for the demonstration and assessment of additionality”;

    (b) “TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”;

    (c) “TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”;

    (d) “TOOL07: Tool to calculate the emission factor for an electricity system”;

    (e) “TOOL 11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”;

    (f) “Standard for sampling and surveys for CDM project activities and programme of activities”.

12. For more information regarding the proposed new methodologies and the tools as well as their consideration by the Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM) please refer to <http://cdm.unfccc.int/goto/MPappmeth>.

3.1. Selected approach from paragraph 48 of the CDM modalities and procedures

13. “Existing actual or historical emissions, as applicable”.

4. Definitions

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

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

    (a) **Safe drinking water (SDW)** - water that conforms to drinking water quality specified in relevant national microbiological quality standards of the host country. In case a national standard is not available, the water shall comply with the performance target as per “Evaluating household water treatment options: Health based targets and microbiological performance specifications”[4];

[4] WHO, http://www.who.int/water_sanitation_health/publications/2011/evaluating_water_treatment.pdf.

(b) **Improved drinking-water source**, **urban area** and **rural area** - are defined in accordance with the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation.[5]

5. Baseline methodology

5.1. Project boundary

16. The spatial extent of the project boundary encompasses the physical, geographical location of each low GHG emitting water purification system installed under the project activity.

17. The greenhouse gases included in or excluded from the project boundary are shown in Table 2.

Table 2. Emission sources included in or excluded from the project boundary

Source		Gas	Included	Justification/Explanation
Baseline	Emissions from electricity/fossil fuels utilized for obtaining safe drinking water displaced due to project activity	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions
Project activity	Emissions from operating project water purification systems	CO_2	Yes	Limited thermal or electrical energy is required.
		CH_4	No	No thermal or electrical energy is required
		N_2O	No	No thermal or electrical energy is required

5.2. Identification of the baseline scenario and demonstration of additionality

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

19. It is assumed that electricity, fossil fuel or biomass is used to boil water as means of water purification in the absence of the project activity.

5.3. Baseline emissions

20. The baseline emissions are calculated based on the energy demand for boiling water, multiplied by the weighted emission factor of the baseline energy source mix. Only purified water consumed for drinking and/or cooking purposes can be used in the baseline calculation.

21. The baseline emissions shall be calculated as follows:

$$BE_y = f_{PS} \times QPW_y \times m \times SEC \times EF_{SDW} \times 10^{-9} \qquad \text{Equation (1)}$$

5 <http://www.wssinfo.org/>.

Where:

BE_y	=	Baseline emissions during the year *y* in (t CO_2e)
f_{PS}	=	Factor accounting for the fraction of population served by point-of-use low GHG emitting water purification technologies in the absence of the project activity (fraction)
QPW_y	=	Quantity of purified water consumed for drinking and/or cooking in year *y* (L)
m	=	Fraction of functional appliances that are providing the SDW (%). Only project appliances that (i) use approved technologies that meet the technology standards as per paragraph 6 (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.
SEC	=	357.48, specific energy consumption required to boil one litre of water[6] (kJ/L)
EF_{SDW}	=	Emission factor associated with the baseline water purification technologies (t CO_2/TJ)

22. The quantity of water purified shall be calculated as follows:

$$QPW_y = min\big(QPW_{M,y}, (n_y \times Py \times (1 - PFR_y) \times min(QPW_{PP}, 5.5))\big) \qquad \text{Equation (2)}$$

Where:

QPW_y	=	Quantity of purified water consumed for drinking and/or cooking in year *y* (L)
$QPW_{M,y}$	=	Monitored quantity of purified water consumed for drinking and/or cooking in year *y* (L)
n_y	=	Number of project water purification systems distributed by year *y*
Py	=	Population who consumes the purified water serviced by one project water purification system in year y
QPW_{PP}	=	Average volume of drinking water per person per day (L) determined ex ante of the crediting period through a baseline survey

6 Specific energy consumption required to boil one litre of water is to be calculated as follows: Heating water with specific heat of 4.186 kJ/L°C from assumed initial temperature of 20°C to 100°C, boiling point at standard conditions. Also, the latent heat required to boil one litre of water for five minutes is assumed to be equivalent to latent heat for the evaporation (2260kJ/L) of 1 per cent of the water volume. WHO recommends a minimum duration of five minutes of water boiling, according to WHO guidelines for Emergency Treatment of drinking water at point of the use. See <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.

5.5	=	Cap of water use per person per day[7] (L)
PFR_y	=	Failure rate of the project water purification systems in year *y* (fraction)

23. The factor for accounting for the fraction of population served, prior to the implementation of the project activity, by point-of-use low GHG emitting water purification technologies shall be determined as follows:

$$f_{PS} = \begin{cases} 1, PS < 0.2 \\ \dfrac{0.5 - PS}{0.3}, 0.5 > PS \geq 0.2 \\ 0, PS \geq 0.5 \end{cases} \quad \text{Equation (3)}$$

Where:

f_{PS}	=	Factor accounting for the fraction of population served by point-of-use low GHG emitting water purification technologies in the absence of the project activity (fraction)
PS	=	Fraction of population served by point-of-use low GHG emitting water purification technologies prior to the implementation of the project activity (fraction)

24. The SDW emission factor shall be calculated as follows:

$$EF_{SDW} = \sum_i f_{FF,i} \times EF_{FF,i} / \eta_{WB,i} \quad \text{Equation (4)}$$

Where:

EF_{SDW}	=	Emission factor associated with the baseline water purification (t CO_2/TJ)
$f_{FF,i}$	=	Fraction of population which would use electricity or fossil fuel type *i* to boil water, prior to the implementation the project activity
$EF_{FF,i}$	=	Emission factor of electricity or fossil fuel type *i* (t CO_2/TJ). Where the fraction $f_{FF,i}$ refers to grid electricity, the respective $EF_{FF,i}$ shall be determined according to the "Tool to calculate the emission factor for an electricity system", and converted to t CO_2/TJ
$\eta_{WB,i}$	=	Efficiency of the baseline water boiling system using fuel type *i* (fraction)

25. The survey for determining $f_{FF,i}$ shall be conducted in a manner which represents various socio-economic conditions in the project boundary. For instance, if the project provides service for both urban and rural households, the sampling shall be designed to be representative of the part of the urban and rural households. Additionally, if a household is using several fuels, the consumption of each fuel type shall be counted separately.

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

26. Furthermore, the population served by point-of-use low GHG emitting water purification technologies shall be excluded when establishing the fossil fuel fractions, as it is already accounted for when calculating f_{PS}.

5.4. Project emissions

27. Project emissions (PE_y) shall be calculated using the latest version of the “TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” and the latest version of “TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”. 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. 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.

5.5. Leakage

28. No leakage is considered.

5.6. Emission reductions

29. As leakage is zero, emission reductions equal the baseline emissions minus project emissions.

5.7. Generic instructions for conducting sampling

30. The “Standard for sampling and surveys for CDM project activities and programme of activities” shall be followed while conducting the sampling.

31. A project database shall be established containing all relevant information for estimating baseline emissions and for sampling the project water purification systems, including, inter alia:

    (a) Details of each user of the water purification systems (name, address, contact details);

    (b) Model and serial number of the water purification device;

    (c) Life span of the water purification device;

    (d) Date of installation/distribution of the water purification device;

    (e) Dates of expiration, replacement or drop-out of the device if such events occur;

    (f) If applicable, dates of distribution and/or changes of filters;

    (g) Checks of operational status.

5.8. Changes required for methodology implementation in 2nd and 3rd crediting periods

32. Consistent with guidance by the Board, project participants shall use the latest version of the methodological tool “TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”.

5.9. Data and parameters not monitored

33. 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:	**PS**
Data unit:	fraction
Description:	The fraction of population served by point-of-use low GHG emitting water purification technologies prior to the implementation of the project activity
Source of data:	Sample survey of the population in the project boundary, before the implementation of the project
Measurement procedures (if any):	The market share shall include all point-of-use water low GHG emitting purification technologies systems which reliably supply SDW
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	QPW_{PP}
Data unit:	L
Description:	Average volume of drinking water per person per day
Source of data:	Estimated using surveys, official data, peer reviewed literature or local expert opinion
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$f_{FF,i}$
Data unit:	fraction
Description:	Fraction of population which would use electricity or fuel type *i* to boil water, prior to the project activity
Source of data:	Sample survey of the population in the project boundary, before the implementation of the project
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$EF_{FF,i}$
Data unit:	t CO_2/TJ
Description:	Emission factor of fuel type *i*

Source of data:	Regional or national default values, or IPCC default values at the upper limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. Where the fraction $f_{FF,i}$ refers to grid electricity, the respective $EF_{FF,i}$ shall be determined according to the “Tool to calculate the emission factor for an electricity system”, and converted to t CO_2/TJ
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	$\eta_{WB,i}$
Data unit:	fraction
Description:	Efficiency of the baseline water boiling system using fuel type *i*
Source of data:	-
Measurement procedures (if any):	Efficiency of the water boiling systems being replaced shall be determined using one of the following options, use average weighted values if more than one type of systems are encountered: (a) The efficiency of the water boiling system shall be established using representative sampling methods or based on referenced literature values; (b) 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; (d) 1.0 default value may be used if the replaced system or the system that would have been used is an electric heating system
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	$EF_{FF,i}$
Data unit:	t CO_2/TJ
Description:	Emission factor of fuel type *i*
Source of data:	Regional or national default values, or IPCC default values at the upper limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. Where the fraction $f_{FF,i}$ refers to grid electricity, the respective $EF_{FF,i}$ shall be determined according to the “Tool to calculate the emission factor for an electricity system”, and converted to t CO_2/TJ
Measurement procedures (if any):	-
Any comment:	-

6. Monitoring methodology

34. 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. All measurements should be

conducted with calibrated measurement equipment according to relevant industry standards.

35. Furthermore, all parameters required by tools referred to by this methodology shall be monitored.

6.1. Data and parameters monitored

Data / Parameter table 7.

Data / Parameter:	***Py***
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 8.

Data / Parameter:	$\mathbf{QPW_{M,y}}$
Data unit:	L
Description:	Monitored quantity of purified water consumed for drinking and/or cooking in year *y*
Source of data:	-
Measurement procedures (if any):	The monitored quantity of water purified shall be monitored directly for all systems or a sample of the systems. This could be inter alia: (a) Integrated flow meters; (b) Count of cleaning kits replacements and a cleaning kit's capacity; (c) Count of purification cycles and the volume of each cycle; (d) Capacity of the equipment established by manufacturers' specifications. The precise measurement procedure depends on the information available for the specific purification system used by the project activity. The most precise method available shall be used, for instance when integrated flow meters exist, they should be used, and not manufacturer's specifications. The failure rate of the project water purification systems shall be taken into consideration, if the monitoring procedure does not account for failed systems. For example, if all systems are monitored, the quantity of purified water is derived directly, whereas if only a sample of the functional systems is taken, it has to be multiplied with PFR_y
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

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 9.

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 approved technologies that are meeting the SDW technology standards as per paragraph 6(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 10.

Data / Parameter:	**PFR_y**
Data unit:	Fraction
Description:	Failure rate of the project water purification systems in year *y*
Source of data:	Directly monitored or survey
Measurement procedures (if any):	-
Monitoring frequency:	At least annually
QA/QC procedures:	-
Any comment:	Replacement water purification system can be claimed to be operating only if there are documented measures in place by the project proponent to ensure that end users have access to replacement purification systems of comparable quality

Data / Parameter table 11.

Data / Parameter:	**n_y**
Data unit:	-
Description:	Number of project water purification systems distributed by year *y*
Source of data:	Latest project database
Measurement procedures (if any):	-
Monitoring frequency:	At least annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 12.

Data / Parameter:	**Check for public distribution system providing SDW**
Data unit:	(Dimensionless)
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 procedures:	-
Any comment:	The project participants should determine whether new public distribution system has been introduced within the project boundary and whether SDW is made available through the public distribution network. In case the SDW is made available through the public distribution network, no claim for emission reduction can be claimed for the households/buildings institutions supplied by the public system

Data / Parameter table 13.

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

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

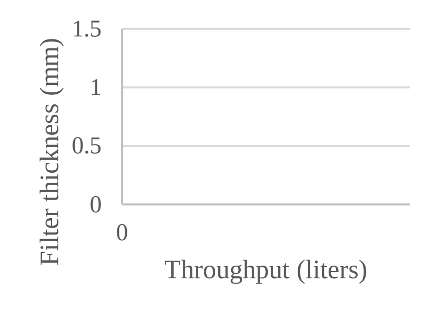

Table above presents a number of potential objective measures for use in ongoing monitoring of safe water programs.

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 2. Non-binding best practice example 5: monitoring usage of a multi-barrier Point of Use (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*
05.0	28 March 2019	EB 102, Annex 05 Revision to: • Update the requirements for demonstrating additionality, taking into account the criteria used in the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation; • Update the eligible technologies as per the recommendations contained in the relevant guidelines published by the WHO; • Elaborate monitoring procedures for different types of technologies/measures; • Clarify the monitoring requirements related to soil filtration technologies; • Expand the 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.
04.0	16 April 2015	EB 83, Annex 3 Revision to expand the applicability of the methodology to scenarios in which the fraction of population with access to improved drinking water is above 60%.
03.0	8 November 2013	EB 76, Annex 6 Revision to: • Introduce standardized approaches to demonstrate additionality and to quantify emission reduction from the use of water purification systems; • Change the title from “AM0086: Installation of zero energy water purifier for safe drinking water application” to “AM0086: Distribution of zero energy water purification systems for safe drinking water”.
02.0.0	23 November 2012	EB 70, Annex 18 Revision to delete the restriction to one single crediting period and provide guidance with regard to the renewal of the crediting period.
01.1.0	26 November 2010	EB 58, Annex 5 Revision to improve the clarity and correct the units of several parameters.
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