Approved baseline and monitoring methodology AM0086

"Installation of zero energy water purifier for safe drinking water application"

I. SOURCE, DEFINITIONS AND APPLICABILITY

Sources

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

- NM0280 "Installation of zero energy water purifier in India" prepared by Hindustan Unilever Limited & their Associate Consultants;
- AM0046 "Distribution of efficient light bulbs to households" prepared by Perspectives Climate Change GmbH, Hamburg, Germany.

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

- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion;
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption;
- Tool for the demonstration and assessment of additionality;
- Tool to calculate the emission factor for an electricity system.

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

Selected approach from paragraph 48 of the CDM modalities and procedures

"Existing actual or historical emissions, as applicable".

Definitions

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

Baseline sample group (BSG). Group of consumers of safe drinking water in the total project area which are surveyed once prior to the start of the project activity to estimate baseline emissions.

Boiled water. Water that conforms to safe drinking water as a result of boiling the water for at least 5 minutes. The World Health Organisation (WHO) guideline applicable to developing countries mentions a boiling time of at least 5 minutes and up to 20 minutes.[1]

Cleaning kit. The part of zero energy water purifiers which is responsible for filtering and/or disinfecting the water. The cleaning kit has a definite life and has to be replaced at the end of its life.
Exhausted cleaning kits. The cleaning kits which have reached the end of their life. The end-of-life indicator turns on when the cleaning kit is exhausted.

[1] <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.

Cleaning kit life. The life of the cleaning kit expressed in terms of the volume of safe drinking water that can be produced by the kit.

Consumer. Households that use safe drinking water. Commercial consumers are not included in this definition.

Point of use water purifier. A water purifier which is used at the site of the consumer of the water (i.e. the water purifier is used by the households which consume the water).

Project area *i*. Distinct geographical area in which zero energy water purifiers are sold under the project activity. All project areas *i* together correspond to the total project area.

Project sample group (PSG). Group of consumers of safe drinking water which are monitored to estimate the project emissions. The consumers included in this group participate in the project activity.

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 standards set by the United States Environmental Protection Agency (US-EPA) or the World Health Organization (WHO) should be referred to instead.

Total project area. Total geographical area in which the zero energy water purifiers are sold under the project activity.

Zero energy water purifier. Equipment that has been certified for its capability to provide the consumer with safe drinking water without the use of energy (thermal or electrical). The zero energy water purifier should conform to the requirements specified in the relevant standard (as per the definition of SDW).

Applicability

This methodology applies to project activities in which point-of-use zero energy water purifiers are sold to consumers in a specific geographical area (total project area).

The methodology is applicable under the following conditions:

(a) The zero energy water purifiers sold under the project activity produce safe drinking water (SDW);

(b) The project participants either (a) purchase the zero energy water purifiers and the cleaning kits from a manufacturer and only arrange for their sale in the host country or (b) both manufacture and sell the zero energy water purifiers and cleaning kits;

(c) The project participants sell the zero energy water purifiers and cleaning kits to the consumers. If the manufacturer of the zero energy water purifiers and the cleaning kits is not a project participant, a contractual agreement between the manufacturer and the project participants shall ensure that the manufacturer does not claim any CERs from producing zero energy water purifiers and cleaning kits;

(d) Zero energy water purifiers, including those manufactured or sold by the project participants or their competitors, should not have a market penetration of more than 1% (at an absolute uncertainty level of ±1%) in each project area (i) and each income group (q) (as defined below in Step 2 in the section of baseline emissions) prior to start date of the CDM project activity. This should be verified by the project participants through a survey of the consumers in the total project area. The survey may be conducted separately or together with the survey of the

baseline sample group. In the case the market penetration is higher than 1% in some project areas (i) or in some income groups (q), these project areas or income groups should be excluded from the project activity;[23]

(e) To provide SDW at all times the zero energy water purifiers should be installed with an end of life indicator and auto switch off mechanism which is triggered once the life of a cleaning kit is exhausted;

(f) Prior to the implementation of the project activity, a public distribution network of safe drinking water does not exist within the total project area and safe drinking water is produced by the consumers by only using point-of-use water purifiers. If during the crediting period SDW is made available in (parts of) a project area (i) through a public distribution network, this methodology can not be applied anymore to this project area from that point in time and the emission reductions pertaining to this project area can not be claimed from that point onwards. This condition should be checked annually during the crediting period.

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

II. BASELINE METHODOLOGY PROCEDURE

Identification of the baseline scenario

The most plausible baseline scenario is identified through a sample survey conducted with consumers in the total project area prior to the start of the project activity. The survey determines which technologies and techniques are used to produce safe drinking water. The baseline scenario is that the share of technologies, as observed historically through the survey, will continue in the absence of the project activity.

Additionality

The project participants shall apply the latest version of the "Tool for the demonstration and assessment of additionality" approved by the Board.

In applying Step 1 of the tool, the following alternatives for the project participants should, *inter alia*, be considered:

(a) Project implementation not undertaken as a CDM project activity;

(b) Sale of water purifiers that require thermal or electrical energy for obtaining safe drinking water. The list of technologies to be considered should at minimum include the technologies implemented according to the BSG survey;

(c) Sale of other zero energy water purifier technologies;

[2] This methodology assumes that the baseline scenario is that the portfolio of technologies used to produce SDW does not change significantly during the crediting period and that zero energy water purifiers would not penetrate in the market in the absence of the CDM. This applicability conditions aims to ensure that this a reasonable assumption: a very low market penetration at the start of the project makes it more plausible that zero energy water purifiers would not gain a significant market share soon in the absence of the project activity.

[3] The project participants proposing a CDM project activity in a project area (i) subsequent to registration of at least one CDM project activity by another project participants in the same project area should submit a request for revision to this methodology for the determination of penetration of technology in the baseline and the relevant benchmark to compare with.

(d) No sale of water purifiers by the project participants. The consumers continue to use their current water purifying technologies and/or purchase new water purifiers from third parties.

In applying Step 2 of the tool, the investment analysis should include the costs for manufacturing or purchasing, distribution and/or sale of zero energy water purifiers, if applicable, including costs for raising awareness. The selling price of the zero energy water purifiers used in the investment analysis shall be based on the cost supported by consumers who consumed safe drinking water in the baseline. Barriers considered in Step 3 of the tool may include the following market penetration barriers:

(a) Perception that water purified by zero energy water purifier may not be as safe as their current water purification practice;

(b) Lack of awareness of consumers on zero energy water purifiers.

In applying Step 3 of the tool, the project participants, in demonstrating market penetration barrier, should clearly state the arrangements through which they plan to share the CDM benefits with the consumers of zero energy purifier.

Project boundary

The spatial extent of the project boundary encompasses the physical, geographical location of each project area *(i)*. The project boundary includes each zero energy water purifier installed under the project activity. The distinct geographical boundary of each project area *(i)* should be clearly documented in the CDM-PDD.

The project boundary also includes the facility or facilities where the zero energy water purifiers and the cleaning kits are manufactured.

The greenhouse gases included in or excluded from the project boundary are shown in Table 1.

Table 1: Emissions 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 fossil fuel or electricity consumed during the manufacturing of the purifiers and cleaning kits	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions

Project emissions

Project emissions include CO_2 emissions due to consumption of fossil fuels and electricity in manufacturing of zero energy water purifiers and cleaning kits.

Project emissions are calculated as follows:

(a) If separate data on the fuel and electricity consumed for the purpose of producing zero energy purifiers and cleaning kits is NOT available, project emissions should be determined based on the total fossil fuel and electricity consumption of the manufacturing facility, by applying the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" and the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". The process *(j)* in the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" then corresponds to all fossil fuel combustion on-site for the purposes of the project activity;

(b) If separate data on the fuel and electricity consumed for the purpose of producing zero energy purifiers and cleaning kits is available, the calculation of project emissions is based on the number of purifiers and cleaning kits sold by the project participants and emission factors per purifier and per cleaning, as follows:

$$PE_y = EF_{pu,y} \times N_{pu,sold,y} + EF_{ck,y} \times N_{ck,sold,y} \quad \textbf{(1)}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2/yr)
$EF_{pu,y}$	=	Project emission factor (including fossil fuel and electricity) per zero energy purifier in year y (t CO2/yr/purifier)
$N_{pu,sold,y}$	=	Number of zero energy water purifiers sold by project participants
$EF_{ck,\ y}$	=	Project emission factor (including fossil fuel and electricity) per cleaning kit in year y (t CO2/yr/cleaning kit)
$N_{ck,sold,y}$	=	Number of cleaning kits sold by project participants

The project emission factors ($EF_{pu,y}$ and $EF_{ck,y}$) for manufacturing of purifiers and cleaning kits are determined as follows:

$$EF_{pu,y} = \frac{PE_{FF,manufacturer,pu,y} + PE_{EL,manufacturer,pu,y}}{N_{pu,manufactured,y}} \quad \textbf{(2)}$$

and

$$EF_{ck,y} = \frac{PE_{FF,manufacturer,ck,y} + PE_{EL,manufacturer,ck,y}}{N_{ck,manufactured,y}} \quad \textbf{(3)}$$

Where:

$EF_{pu,y}$	=	Project emission factor ~~per~~ for zero energy purifier in year *y* (t CO_2/purifier)
$PE_{FF,manufacturer,pu,y}$	=	CO_2 emissions from fossil fuels used for the production of zero energy purifiers at the facility manufacturing the purifiers in year *y* (t CO_2~~/yr~~)
$PE_{EL,manufacturer,pu,y}$	=	CO_2 emissions from electricity consumed for the production of zero energy purifiers at the facility manufacturing the purifiers in year *y* (t CO_2~~/yr~~)

$N_{pu,manufactured,y}$	=	Number of zero energy water purifiers produced by the facility manufacturing the purifiers in year *y* (dimensionless)
$EF_{ck,y}$	=	Project emission factor ~~per~~ for cleaning kit in year *y* (t CO_2/purifier)
$PE_{FF,manufacturer,ck,y}$	=	CO_2 emissions from fossil fuels used for the production of cleaning kits at the facility manufacturing the cleaning kits in year *y* (t CO_2/~~yr~~)
$PE_{EL,manufacturer,ck,y}$	=	CO_2 emissions from electricity consumed for the production of cleaning kits at the facility manufacturing the cleaning kits in year *y* (t CO_2/~~yr~~)
$N_{ck,manufactured,y}$	=	Number of cleaning kit produced by the facility manufacturing the cleaning kits in year *y* (dimensionless)

$PE_{FF,manufacturer,pu,y}$ and $PE_{FF,manufacturer,ck,y}$ will be determined using the latest approved version of "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" where they correspond to parameter $PE_{FC,j,y}$ of the tool.

$PE_{EL,manufacturer,pu,y}$ and $PE_{EL,manufacturer,ck,y}$ are determined using the latest approved version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" where they correspond to parameter $PE_{EC,y}$ of the tool.

Baseline emissions

Baseline emissions include CO_2 emissions from fossil fuels and electricity that would in the absence of the project be utilized for obtaining safe drinking water. These emissions depend on the type of water purifying technology used and how the technologies are applied in practice. The baseline scenario is that the current practices and the mix of technologies used prior to the implementation of the project activity would continue to be applied. Accordingly, baseline emissions are calculated based on the weighted average CO_2 emissions of the water purifying technologies and techniques used prior to the implementation of the project activity.

The baseline emissions are established by surveying a BSG of households. This baseline survey is conducted once prior to the implementation of the project activity. It serves to collect data on the current use of water purifying technologies. An example for a questionnaire for the survey of the BSG is provided in Appendix B.

In addition, a project sample group (PSG) is established, which is comprised of the consumers of zero energy water purifiers and cleaning kits sold under CDM project. The PSG is regularly surveyed during the crediting period. The PSG serves to collect data on the use of the zero energy water purifiers and cleaning kits under the project activity.

Using the data from the surveys, the baseline emissions are then calculated based on (a) the amount of safe drinking water that is generated by the zero energy water purifiers and cleaning kits used under the project activity, (b) a weighted average emission factor for the CO_2 emissions associated with obtaining safe drinking water in the baseline and (c) adjustment factors to account for indirect effects.

The baseline emissions are estimated through the following steps:

Step 1: Stratification of the consumers;

Step 2: Determination of the sample size of the survey to determine the penetration of zero energy water purifier technology prior to the start of the project activity;

Step 3: Determination of the sample size of the BSG;

Step 4: Determination of the sample size of the PSG;

Step 5: Establishment of a sampling database and a sampling plan;

Step 6: Implementation of the surveys;

Step 7: Determination of the quantity of water purified per kit;

Step 8: Determination of the specific fuel or electricity consumption of the baseline purification technologies;

Step 9: Calculation of baseline emissions.

Step 1: Stratification of the consumers

The households should be stratified with regard to the following three different levels:

- Level-1: Stratification of the households within the total project area into the project areas *(i)* consisting of different geo-climatic zones in order to reflect climatic effects on the consumption of water and hence use of water purifiers;
- Level-2: Stratification of the households in each project area *(i)* into an urban or rural area *(p);*
- Level-3: Stratification of the households into household income groups *(q)* in order to reflect the household income on the use of water purifiers.

Stratification of the households within the total project area into different project areas *(i)*

The distinct geographical boundary of each project area *(i)* should be clearly documented in the CDM-PDD. The minimum size of the project area (*i*) is a geographical region with a population size of at least 100,000. There is no upper limit on the population size of the project area (*i*). The project area could be a district, state or a region. The stratification into project areas should reflect different climatic conditions in the host country, such as different geo-climatic zones. Any existing official climatic zones can be used.[4] Otherwise, meteorological and geographical data should be used to distinguish geo-climatic zones.

Stratification of the households in each project area *(i)* into a rural or urban segment *(p)*

This stratification can, for example, be done based on the relevant official maps.

[4] Example: the Bureau of Energy Efficiency (BEE), India has released a climatic zone map of India which is based on the geo-climatic conditions. India has been divided into 5 distinct zones, for an instance, one of the zones is "hot and dry" which is characteristic of "high temperature, low humidity and rainfall, intense solar radiation, a clear sky, hot winds during day and cold winds at night, sandy or rocky ground with little vegetation, low underground water table and few sources of surface water".

Stratification of the households into different household income groups *(q)*

Depending upon the data availability in the host country one of the following methods should be used for this stratification:[5]

(1) In case households of different income levels are situated in distinct areas

This method can be used if there are distinctly identifiable residential areas for households of each income level. Under this method, the urban and rural segments *(p)* are further stratified into 3 sub-areas, i.e. areas with Low Income Group (LIG), Middle Income Group (MIG) and High Income Group (HIG).

(2) In case where distinct areas for households of each income group cannot be identified

This method can also be used where the households of two or all three income levels are situated in the same area. The following method of stratification should be followed:

(a) The individual households are surveyed and the information on income level is collected;

(b) The income group (HIG, MIG or LIG), to which the household belongs, is determined;

(c) The remaining number of houses to be surveyed for the specific income group (as the sample size is determined for each income group) is recounted based on the income level of the house surveyed. For example, the sample size for HIG income group is 400 and the first house surveyed for income level in the project area belongs to HIG, the remaining number of houses to be surveyed for HIG is recounted as 399. The project segments *(p)* and income groups *(q)* are to be determined in accordance with the method-1 above.

In the case where no data or only limited data is available on the income levels of households, the project participants may also conduct a pre-survey to assess whether method (1) or (2) above can be applied or whether the income of households needs to be surveyed. The pre-survey may also help in designing the main survey in method (2).

Data on household income used for the stratification may include (a) information collected from the survey, (b) government records (e.g. for tax purposes), (c) relevant studies or publications on households income level, and/or (d) property prices as a proxy for household income.

The stratification method applied by the project should be documented transparently in the CDM-PDD, including the geographical boundaries of all project areas *(i)* and the definitions, approaches and underlying assumptions used to distinguish rural and urban areas *(p)* and income groups *(q)*.

Step 2: Determination of the sample size of the survey to determine the penetration of zero energy water purifier technology prior to the start of the project activity

A survey should be carried out to determine the market penetration of zero energy water purifier technology (sold by the project participants or their competitors) for each project area *(i)*, each segment

[5] The project participants applying the methodology may submit a request for revision if the criteria of for stratification of households based on their income level does not work for the country-specific situation.

(p) and each income group *(q)*).[6] In case the market penetration of zero water purifier technology is larger than 1% in any of the income group *(q)*, the CDM project activity cannot be carried out in the specific income group *(q)* using this methodology. This pre-survey can be conducted either separately or together with the survey defined in the next step (Step 3).

The minimum sample size of the survey for each income group *(q)* of each segment *(p)* in each project area *(i)* is determined by using the formula developed by Cochran (1977)[7] for large or infinite population as given below. This formula should be applied by assuming x=0.01, y=0.99, z=1.96 (at 95% confidence interval) and e_1=0.01.

$$n_{1\%} = \frac{z^2 xy}{e_1^{\ 2}} \qquad \textbf{(4)}$$

Where:

$n_{1\%}$	=	Number of consumers included in the survey for each income group *(q)* of segment *(p)* in project area *(i)* to assess the applicability condition that the zero energy purifier technology has not a market penetration larger than 1% prior to the implementation of the project activity (Dimensionless)
~~X~~x	=	Estimate of variance in the primary variables of interest in the survey (value 0.01)
~~Y~~y	=	1-x = 0.99
e_1	=	Precision level or acceptable margin of error (value 0.01)
z	=	~~Z~~z-value as the value of the standard variate at the given confidence level, to be obtained from the z-distribution table (value 1.96 at 95% confidence interval)

Note: A value of 380 should be used for $n_{1\%}$, which is the result of solving equation 4, as all the variables to determine this sample size are known. Note that this refers to the minimum number of households from which information should be collected. The project participants may choose a larger sample size to account for households for which no response can be collected.

Step 3: Determination of the sample size of the BSG

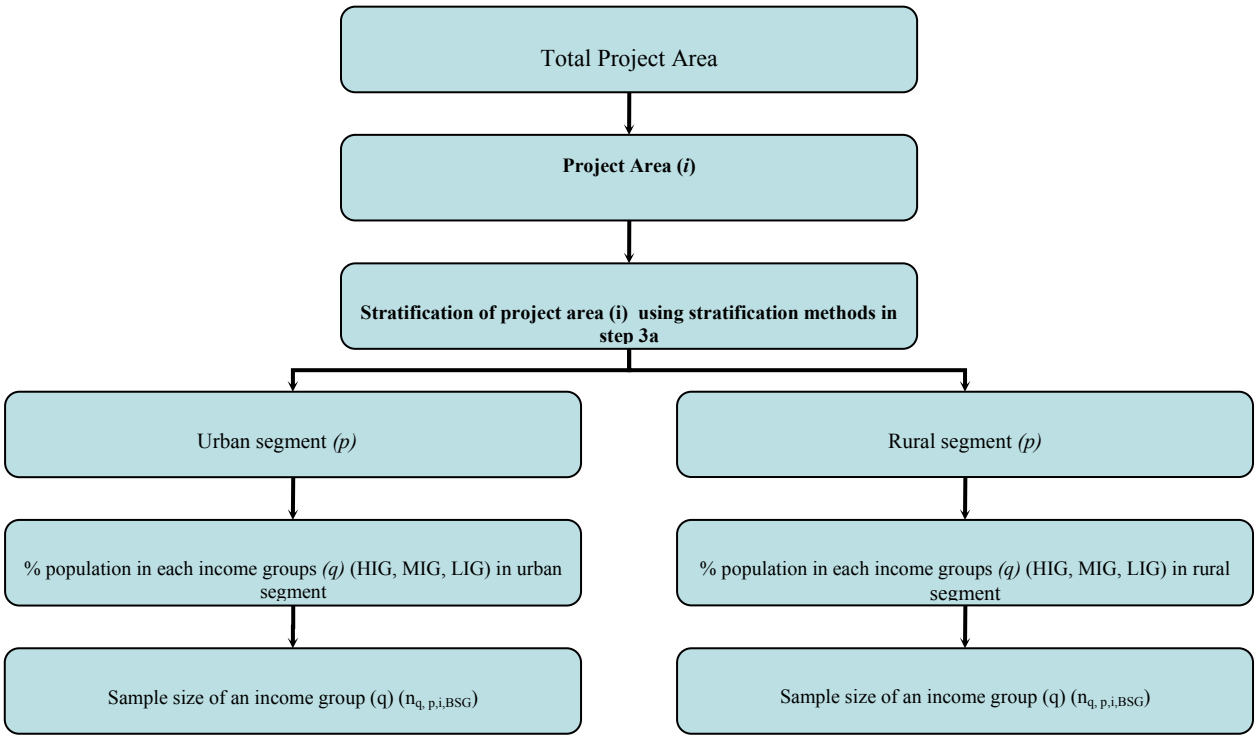
A survey of a BSG, separately for each income group *(q)*[8] is required to be carried out to find out to what extent each water purification technology is used by the consumers prior to the implementation of the project activity. The minimum sample size of the BSG ($n_{q,p,i,BSG}$) for each income group *(q),* of rural or urban segment *(p)* in each project area (*i*), is determined by using the equation 4. In this equation $n_{1\%}$ should be replaced with $n_{q,p,i,BSG}$.

Note: Alternatively, a value of 380 should be used for $n_{q,p,i,BSG}$ which is the result of solving equation 4, as all the variables to determine this sample size are known. Note that this refers to the minimum number of households from which information should be collected. The project participants may choose a larger sample size to account for households for which no response can be collected.

[6] There could be maximum six strata to be surveyed in each project area *(i)* i.e. based upon HIG, MIG and LIG income groups of urban and rural segments. Each stratum will be surveyed based on the sample size determined for the same.

[7] Cochran W.G., (1977), Sampling Techniques, 3rd Edition, New York: John Wiley & Sons.

[8] There could be maximum six strata to be surveyed in each project area (i) i.e. based upon HIG, MIG and LIG income groups of urban and rural segments. Each stratum will be surveyed based on the sample size determined for the same.



Step 4: Determination of the sample size of the PSG

A survey of a PSG should be conducted among the households to which zero energy water purifiers are sold. The population of consumers of zero energy purifiers should be stratified as in the BSG. The sample size will be determined as per the Cochran formula for a finite population as follows:[9]

$$n_{q,p,i,PSG} = \frac{z^2 xyN}{e^2(N-1)+z^2 xy} \quad \textbf{(5)}$$

Where:

$n_{q,p,i,PSG}$ = Minimum number of zero energy water purifier consumers from income group *(q)* of segment *(p)* in project area (*i*) to be included in the PSG (Dimensionless)

N = Population size in individual income group *(q)* of segment *(p)* in project area (*i)* The population will be restricted to the consumers of zero energy water purifier and therefore would take into account the growth in sales of purifier every year (Dimensionless)

e = Precision level or acceptable margin of error (5% or 0.05)

x = Estimate of variance in the primary variables of interest in the survey taken as 0.5

y = 1-x = 0.5

z = Z-value as the value of the standard variate at the given confidence level, to be obtained from the z-distribution table (use 1.96 as this is the value for 95% confidence level)

[9] Kothari, C.P., Research Methodology: Methods & Techniques, 2nd Edition, New Age International Publication, New Delhi.

Note that this refers to the minimum number of households from which information should be collected. The project participants may choose a larger sample size to account for households for which no response can be collected.

Step 5: Establishment of sampling database and a sampling plan

A project activity implementation plan specifies the procedure for establishing and documenting the project activity in the CDM-PDD, including *inter alia*, information on the total number of project activity purifiers ($n_{pu,sold}$) and cleaning kits ($n_{ck,sold}$) that are planned to be sold by the project activity in each project area *(i)* over the duration of the crediting period.

Prior to the sale of purifiers and cleaning kits under the project activity, all households included in the baseline sample group should be included in a database. The following information[10] should be sought in order to develop a monitoring system database referred as Central Database System (CDS):

(a) A list of all project areas *(i)*, segments *(p)* and income groups *(q)* including the name or number of the project area;

(b) A list of consumers of SDW included in the BSG[11] and list of consumers of zero energy purifiers included in PSG including the information to identify the consumer (name, address, applicable income group, segment and project area);

(c) For each consumer included in the PSG, information on when the consumer has been added to the PSG and information on when it has been removed (if applicable);

(d) For consumers included in the BSG and PSG, the information according to sample survey questionnaires included in Appendix B and Appendix C respectively should be collected. Any additional information can also be collected on need basis;

(e) An extract of the database should be attached to the CDM-PDD and to each monitoring report;

(f) The information should be available for crediting period plus 2 years.

Step 6: Implementation of the surveys

The BSG and PSG surveys are carried out by using the questionnaires as given in Appendix B and Appendix C respectively to this methodology by visiting selected households of each income group. The survey to determine the penetration of zero energy water purifier technology prior to the start of the project activity may only include questions (1) and (2) in the survey in Appendix B.

The following survey principles shall be applied for all surveys:

(1) For each income group *(q)* of segment *(p)* in project area *(i)*, systematic random sampling should be ensured. This should be done by selection of every k^{th} element from a sampling frame, where k, the sampling interval, would be calculated as:

k = population size (N) of income group/sample size (n) for income group.

(2) The starting point of sampling for survey is randomly selected;

(3) Only persons over age 15 are interviewed;

[10] Refer sample survey questionnaire formats for BSG and PSG in Appendix B and Appendix C.
[11] Maintained as separate information; but may not be part of CDS

(4) The PSG survey shall be conducted once every year;

(5) For the PSG: in case any consumer stops using the purifier or starts using other purification technique, this should be noted in the database and the consumer should not be included in the PSG.

Step 7: Determination of the quantity of water purified per kit

The quantity of water purified per cleaning kit sold in year *y*, during its lifetime ($Q_{ck,y}$), should be determined through measurements by an independent laboratory. The CDM-PDD should transparently document the procedures and methods followed by the laboratory. In case the quantity of water purified through the purifier is dependent on the quality of the water, such as suspended solids and hardness, the laboratory should determine $Q_{ck,y}$ for the applicable range of different water qualities and the most conservative value (i.e. the lowest value) should be adopted for the calculation purposes. $Q_{ck,y}$ will be monitored annually during the crediting period in order to take into account the changing quality of water in year *y* and potential changes in the design of the cleaning kits, including their water purifying capacity.

Step 8: Determination of the specific fuel or electricity consumption of the baseline purification technologies/techniques

The emission factors (EF_t) of the water purifying technology/technique *(t)* that provide safe drinking water should be determined by independent laboratories. The emission factors should be determined as follows:

(a) For a water purification technology/technique that requires combustion of a fossil fuel, the CO_2 emissions should be determined based on the measured fuel consumption per m^3 of purified water. The CO_2 emissions from fossil fuel consumption are determined as per the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel consumption";

(b) For a water purification technology/technique that requires use of electricity, the CO_2 emissions should be determined based on the measured electricity consumption per m^3 of purified water. The CO_2 emissions from electricity consumption are determined as per the latest approved version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", assuming for all consumers that electricity is purchased from the grid (i.e. applying Scenario A in the tool);

(c) For a water purification technology/technique that requires use of other sources of energy (e.g. biomass, solar energy), an emission factor of zero should be used.

Following two options can be used to determine the EF_t for the percentage of the consumers under BSG, who do not use any water treatment or use a treatment which does not provide the SDW:

(a) Use the most conservative emission factor from the technologies identified in the correspondent income group *(q)* of segment *(p)* in project area *(i)*;

(b) Use the weighted average emission factor of the technologies used by households in the income group *(q)* of segment *(p)* in project area *(i)*. Note that this option can only be used if the number of households that produce safe drinking water and that responded to the survey is equal to or larger than the minimum sample size established in step 3 above.

The water purifying technologies/techniques should be defined in a manner that differences in the type or quantity of fuels/electricity consumed are appropriately reflected. For example, if several types of electric devices are used, a sub-classification of electric devices may be necessary to reflect differences in electricity consumption. In case of boiling of water in a household utensil or boiling pan, the laboratory

results should be obtained for boiling of water for a maximum duration of five minutes. In the case that several fuel types can be used in one device, the fuel type with the lowest CO_2 emission factor should be used for calculating EF_t. The EF_t for each technology/technique (t) should be determined once at the time of validation.

Each water purifying technology/technique should be described transparently in the CDM-PDD, including its technical characteristics, the application practices, any assumptions made in determining the fuel or electricity consumption, the measurement methods applied and the measurement results.

For the purpose of laboratory level monitoring, any nationally accredited laboratory may be chosen.

Step 9: Calculation of baseline emissions

Baseline emissions are calculated as follows:

$$BE_y = Q_{ck,y} \times (1 - DF) \times \sum_i \sum_p \sum_q \left(N_{ck,q,p,i,y} \times EF_{BL,q,p,i} \times f_{psy,q,p,i,y} \times f_{ndw,q,p,i,y} \times f_{exh,q,p,i,y} \times 0.95 \right) \quad \textbf{(6)}$$

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2/~~year~~)
$Q_{ck,y}$	=	Quantity of water that can be purified through a cleaning kit, sold in year *y*, during its lifetime (m^3/kit)
DF	=	Discount factor accounting for the consumers that already used zero energy water purifiers prior to the implementation of the project activity (Dimensionless)
$N_{ck,q,p,i,y}$	=	Number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)
$EF_{BL,q,p,i}$	=	Average baseline emission factor for generation of safe drinking water by consumers belonging to income group *(q),* to segment *(p)* and to project area *(i)* (tCO_2/m^3)
$f_{psy,q,p,i}$	=	Factor to account for psychological barriers of consumers belonging to income group *(q)* , to segment *(p)* and to project area *(i)* in year *y* (Dimensionless)
$f_{exh,q,p,i}$	=	Factor to account for ~~in~~ non-exhausted cleaning kits of consumers belonging to income group *(q),* to segment *(p)* and to project area *(i)* in year *y* (Dimensionless)
$f_{ndw,q,p,i}$	=	Factor to account for non-drinking use of purified water of consumers belonging to income group (*q*), to segment *(p)* and to project area *(i)* in year *y* (Dimensionless)
0.95	=	Factor related to net-to-gross ratio (Dimensionless)

Determination of DF

The Discount Factor (DF) should be determined based on the data collected from each income group *(q)* in project area *(i)* either during the survey referred to in Step 2 above or the BSG survey. The factor should be calculated using the following equation:

$$DF = \frac{N_{BL,pu}}{N_{PJ,pu,y}} \quad \textbf{(7)}$$

Where:

DF	=	Discount factor accounting for the consumers that already used zero energy water purifiers prior to the implementation of the project activity
$N_{BL,pu}$	=	Number of consumers in the total project area that already used zero energy water purifiers prior to the implementation of the project activity
$N_{PJ,pu,y}$	=	Number of consumers in the total project area that use zero energy water purifiers, sold by the project participants, in year *y*

The survey determining $N_{BL,pu}$ should account for the following three possible cases:

(1) Zero energy purifiers are not used at all prior to the implementation of the project activity;

(2) Only zero energy water purifiers manufactured by project participants are available in market prior to the implementation of the project activity;

(3) Zero energy water purifiers manufactured by project participants and their competitors are available in market prior to the implementation of the project activity.

Determination of $EF_{BL,q,p,i}$

The average baseline emission factor is determined separately for income group *(q)* of segment *(p)* in project area *(i)*. For example, in the case of three income groups (q), one rural and one urban segment *(p)* and two project areas *(i)*, 12 different emission factors are determined. The emission factors are determined based on data collected from the sample group and laboratory data on the emission factors of the different technologies to produce safe drinking water. $EF_{BL,q,p,i}$ is determined as follows:

$$EF_{BL,q,p,i} = \frac{1}{n_{BSG,q,p,i}} \times \sum_{i} \sum_{p} \sum_{q} \sum_{t} \left(n_{BSG,q,p,i,t} \times EF_{t} \right) \quad \textbf{(8)}$$

Where:

$EF_{BL,q,p,i}$	=	Average baseline emission factor for generation of safe drinking water by consumers of income group belonging to income group *(q)*, to segment *(p)* and to project area (*i*) (tCO_2/m^3)
$n_{BSG,q,p,i}$	=	Number of consumers which are included in the BSG and belong to income group *(q)*, to segment *(p)* and to project area *(i)* (Dimensionless)
$n_{BSG,q,p,i,t}$	=	Number of consumers which are included in BSG and belong to income group *(q)*, to segment *(p)* and to project area *(i)* and use water purifier technology/technique *t* (Dimensionless)
EF_t	=	CO_2 emission factor of water purifying technology/technique *t* (tCO_2/m^3)
i	=	Project areas
p	=	Segments (urban, rural)
q	=	Income groups (HIG, MIG, LIG)
t	=	Water purifying technologies

Capping on the number of cleaning kits consumed ($N_{ck,y}$)

The implementation of the project activity could result in a "rebound effect", i.e. water consumption could increase as a result of reduced costs to purify the water. This effect could potentially lead to an overestimation of baseline emissions and, as a consequence, to an overestimation of emission reductions. In order to address the rebound effect, the number of cleaning kits per consumer should be capped to the average drinking water consumption per household per year, as follows:

(a) Obtain the average drinking water consumption per household per year ($Q_{avg,q,p,i}$) from the BSG survey, based on the household size and the quantity of water consumed for drinking per person per day in the household;

(b) Obtain the laboratory results from Step 7 above on the volume of water purified per cleaning kit ($Q_{ck,y}$);

(c) The ratio between the average volume of drinking water consumption per household per year ($Q_{avg,q,p,i}$) and the volume of water purified per cleaning kit ($Q_{ck,y}$) provides the maximum number of cleaning kits required by the household in a given year;

(d) Furthermore, deduct one cleaning kit from the calculated number of cleaning kits for the first year of the crediting period. This is to further ensure conservativeness and also because the last cleaning kit sold may still be in use at the time of estimation of emission reduction for the year *y*.

The formulae for arriving at the cap on cleaning kit consumed is provided below:

$$N_{ck,q,p,i,y} = \min(N_{ck,sold,q,p,i,y}, n_{q,p,i,y} \times [(Q_{avg,q,p,i} / Q_{ck,y}) - 1]) \quad \textbf{(9)}$$

$$N_{ck,q,p,i,y} = \min(N_{ck,sold,q,p,i,y}, n_{q,p,i,y} \times [(Q_{avg,q,p,i} / Q_{ck,y})]) \quad \textbf{(10)}$$

Equation 9 should be used for the first year of crediting period. From the 2nd year onwards, equation 10 should be applied.

Where:

$N_{ck,q,p,i,y}$ = Number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)

$N_{ck,sold,q,p,i,y}$ = Number of cleaning kits collected from consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y* (In case collection of cleaning kits is undertaken for incineration as required by the host country regulation) or number of cleaning kits sold in year *y* (in case collection is not undertaken) (Dimensionless)

$n_{q,p,i,y}$ = Number of households in the income group *(q)* of segment *(p)* in project area *(i)* to which cleaning kits were sold by the project participants in year *y* (Dimensionless)

$Q_{avg,q,p,i}$ = Average drinking water consumption of a household in the income group *(q)* of segment *(p)* in project area *(i)* ~~in year *y*~~ (m^3/household)

$Q_{ck,y}$ = Quantity of water that can be purified through a cleaning kit, sold in year *y*, during its lifetime (m^3/kit)

Note: As proposed in the methodology, the emission reduction is calculated for the number of cleaning kits actually consumed. The replaced or rectified cleaning kits should be identifiable and should not be used for estimating baseline emissions.

Factor for psychological barrier ($f_{psy,q,p,i,y}$)

The use of zero energy water purifiers may face a psychological barrier: the consumers may continue to apply the pre-project SDW treatment method in spite of installation of zero energy water purifier. For example, water purified with a zero energy water purifier may be re-boiled by the consumers. This effect should be captured as part of the survey of the PSG and an adjustment factor ($f_{psy,q,p,i,y}$) should be determined for each income group *(q)*, segment *(p)* and project area *(i)* in year *(y)*. The following equation is used to estimate this factor:

$$f_{psy,q,p,i,y} = 1 - N_{psy,q,p,i,y} / N_{ck,q,p,i,y} \quad \textbf{(11)}$$

Where:

$f_{psy,q,p,i,y}$ = Factor to account for psychological barriers of consumers belonging to income group *(q)* , to segment *(p)* and to project area *(i)* in year *y* (Dimensionless)

$N_{psy,q,p,i,y}$ = Number of cleaning kits in income group *(q)* of segment *(p)* in project area *(i)* from which the purified water was re-boiled in year *y* (Dimensionless)

$N_{ck,q,p,i,y}$ = Number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y*. The following values should be used depending upon the collection of kits.
(1) In case collection of cleaning kits is not done, it is the number of cleaning kits consumed by consumers in income group *(q)* of segment *(p)* in project area *(i)* in year *y;*
(2) In case collection of cleaning kits is done, it is the number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y*

Factor of ~~inexhausted~~ non-exhausted cleaning kits ($f_{exh,q,p,i,y}$)

Emission reduction should not be claimed for those cleaning kits which are not fully exhausted. It might be possible that a cleaning kit has not reached the end of life and is being replaced without having been fully used or not used at all. In case restrictive trade policy exists in a country then, the number of ~~in~~ non-exhausted cleaning kits would be obtained by the project sample survey. While in cases where collection of cleaning kits by the project participant is required as per the country regulation, the number of exhausted cleaning kits would be based on the actual number of exhausted kits collected by the representative of the project participants. The ~~in~~ non-exhausted cleaning kits can be identified from the end-of-life indicator. The following equation is used to estimate the factor of ~~in~~ non-exhausted cleaning kits:

$$f_{exh,q,p,i,y} = 1 - (N_{non-exh,q,p,i,y} \; x \; 0.5) / N_{ck,q,p,i,y} \quad \textbf{(12)}$$

Where:

$f_{exh,q,p,i,y}$ = Factor to account for ~~inexhausted~~ non-exhausted cleaning kits of consumers belonging to income group *(q)* , to segment *(p)* and to project area *(i)* in year *y* (Dimensionless)

~~N_{in}~~$N_{non-exh,q,p,i,y}$ = Number of ~~in~~ non-exhausted cleaning kits by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)

$N_{ck,q,p,i,y}$ = Number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)

0.5 = It is conservatively assumed that at least half the life of the ~~in~~ non-exhausted cleaning kit would have passed before the cleaning kit was discarded. Hence the factor accounts for half the number of the cleaning kits

Factor to account for non-drinking use of purified water ($f_{ndw,q,p,i,y}$)

Emission reductions should not be claimed for purified water that is used for non-drinking purposes.[12] The amount of water used for non-drinking purposes should be determined from the PSG survey. Following equation is used to estimate this factor:

$$f_{ndw,q,p,i,y} = 1 - N_{ndw,q,p,i,y} / N_{ck,q,p,i,y} \quad \textbf{(13)}$$

~~$N_{ndw,q,p,i,y} = \sum_x n_{x,q,p,i,y} \times p_{x,y}$~~

$$N_{ndw,q,p,i,y} = \sum_x n_{x,q,p,i,y} \times mf \quad \textbf{(14)}$$

[12] The non-drinking purpose includes washing, bathing etc, however may also include anything made for drinking/eating purpose which leads to further energy consumption on purified water e.g. tea made from boiling of purified water, or rice cooked using purified water.

Where:

$f_{ndw,q,p,i,y}$ = Factor to account for non-drinking use of purified water of consumers belonging to income group *(q)* , to segment *(p)* and to project area *(i)* in year *y* (Dimensionless)

$N_{ndw,q,p,i,y}$ = Number of cleaning kits used for non-drinking purpose by consumers in the income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)

$N_{ck,q,p,i,y}$ = Number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)

$n_{x,q,p,i,y}$ = Number of cleaning kits sold to household *x* in the income group *(q)* of segment *(p)* in project area *(i)* in year *y* (Dimensionless)

mf = Multiplication factor to discount the number of cleaning kits used for non-drinking purposes (based on 365 days in one year) (Dimensionless)

The multiplication factor (*mf*) to discount the number of cleaning kits used for non-drinking purposes should be determined as follows:

(a) Use a default value of 0.1 if the household does not use purified water for non-drinking purposes;

(b) Further subtract a default value of 0.0002 from 0.1 for each usage of water for non-drinking purposes in a year. For example, if the household uses purified water for non-drinking purposes, once in six months, there is two-times such likely usage will be done and therefore 0.004 should be subtracted from 1. If there is one such usage of water per week, the value of 0.104 should be subtracted from 1 (based on 52 weeks in one year). If usage of water for non-drinking purpose is once per day, the value of 0.73 should be subtracted from 1.

Factor related to net-to-gross ratio (0.95)

The fix value of 0.95 should be used for this factor. This factor indicates that about 5% of the consumers of zero energy purifiers would have used this technology without CDM itself (free riders).

Leakage

No significant leakage is being envisaged in this methodology. If the purifier and cleaning kit is bought from another country than the host country, then emissions related to transportation should be accounted.

Emission reductions

Emission reductions are calculated as follows:

~~$ER_y = BE_y - PE_y - LE_y$~~

$$ER_y = BE_y - PE_y \quad \textbf{(15)}$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e~~/yr~~)

BE_y = Baseline emissions in year *y* (t CO_2e~~/yr~~)

PE_y = Project emissions in year *y* (t CO_2~~/yr~~)

~~LE_y = Leakage emissions in year y (t CO_2/yr)~~

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

This methodology is applicable to maximum one crediting period of 10 years.

Data and parameters not monitored

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:	*mf*
Data unit:	(Dimensionless)
Description:	Multiplication factor to discount the number of cleaning kits used for non-drinking purposes
Source of data:	-
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter:	$Q_{avg,q,p,i}$
Data unit:	m^3/~~year~~household
Description:	Average drinking water consumption of a household in the income group *(q)* of segment *(p)* in project area *(i)*
Source of data:	Conservative of the values obtained from following sources: (1) Available recent local, national or international studies; (2) Past study conducted by the manufacturer of the zero energy water purifier; (3) Baseline Sample Group survey
Measurement procedures (if any):	Average number of people in a household in the income group *(q)* of segment *(p)* in project area *(i)* X average of water consumed per person per household per day in the income group *(q)* of segment *(p)* in project area *(i)* obtained from the sources discussed above (most conservative value to be used based on these sources X 365 days)
Any comment:	This is used for capping the maximum water consumption of households to be allowed to claim emission reduction

Data / Parameter:	EF_t
Data unit:	tCO_2/m^3
Description:	CO_2 emission factor of water purifying technology/technique *t* (tCO_2/m^3)
Source of data:	Laboratory monitoring of technology/technique *t*
Measurement procedures (if any):	Refer Step 8 of baseline emissions
Any comment:	-

Data / Parameter:	$N_{BL,pu}$
Data unit:	(Dimensionless) ~~Number~~
Description:	Number of consumers in the total project area that already used zero energy water purifiers prior to the implementation of the project activity
Source of data:	To be determined using survey in Step 2 of section of baseline emissions
Measurement procedures (if any):	-
Any comment:	-

III. MONITORING METHODOLOGY

All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

(a) *Ex post* collection of all data required for calculation of the grid emission factor according to "Tool to calculate the emission factor for an electricity system", in case the grid electricity is used in manufacturing of purifiers and cleaning kits at manufacturing facility;

(b) *Ex post* identification of the number of consumers that have received cleaning kits from the project participants;

(c) *Ex post* collection of data on the number of cleaning kits sold. Data and parameters monitored;

(d) All parameters required by tools referred in this methodology, although not covered in the tables of data monitored;

(e) The laboratory level monitoring of quantity of water purified by cleaning kits sold in year *y*.

Data and parameters monitored

Data / Parameter:	$N_{pu,sold,y}$
Data unit:	(Dimensionless)
Description:	Number of zero energy water purifiers sold by project participants
Source of data:	The data available in the PSG database and the sales record of project participants
Measurement procedures (if any):	Database/ record to be updated for every sale made
Monitoring frequency:	Annual
QA/QC procedures:	-
Any comment:	This data is used to estimate the project emissions related to manufacturing of zero energy purifiers

Data / Parameter:	$N_{ck,sold,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of cleaning kits sold by project participants
Source of data:	Annual Sales/ Collection Record
Measurement procedures (if any):	The project participants arranges for the sale of zero energy water purifiers as well as the ongoing sale of cleaning kits. For each household the number of cleaning kits sold/collected should be recorded in the invoices/collection inventory reports. This value will also appear in the annual sales/Collection record of the year
Monitoring Frequency	Annual
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	-

Data / Parameter:	$Q_{ck,y}$
Data unit:	m^3/kit
Description:	Quantity of water that can be purified through a cleaning kit, sold in year *y*, during its lifetime ~~(m^3/kit)~~
Source of data:	Most conservative quantity obtained from the results of laboratory
Measurement procedures (if any):	The measurements shall be done in accordance with the experimental-setup described in the CDM-PDD. The laboratories should have national/international accreditation
Monitoring frequency	Annual
QA/QC procedures	-
Any comment:	Refer to Step 7 of baseline emissions

Data / Parameter:	$N_{PJ,pu,y}$
Data unit:	(Dimensionless) ~~number~~
Description:	Number of consumers in the total project area that use zero energy water purifiers, sold by the project participants, in year *y*
Source of data:	To be determined from PSG database
Measurement procedures (if any):	-
Monitoring frequency	Annual
QA/QC procedures	-
Any comment:	-

Data / Parameter:	$n_{q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of households in the income group *(q)* of segment *(p)* in project area *(i)* to which cleaning kits were sold by the project participants in year *y*
Source of data:	Annual Sales Record
Measurement procedures (if any):	-
Monitoring Frequency	Annual
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	-

Data / Parameter:	$N_{ck,sold,q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of cleaning kits collected from consumers of income group (q) of segment (p) in project area (i) in year y (In case collection of cleaning kits is undertaken for incineration as required by the host country regulation) or number of cleaning kits sold in year y (in case collection is not undertaken)
Source of data:	From incineration records or PSG survey records or Annual Sales Record
Measurement procedures (if any):	-

Monitoring Frequency	Annual
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	This number should not account for the cleaning kit distributed free by the project participants as promotional offer and hence CERs would not be considered for these cleaning kits

Data / Parameter:	$N_{psy,q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of cleaning kits in income group *(q)* of segment *(p)* in project area *(i)* from which the purified water was re-boiled in year *y*
Source of data:	Project Sample Group Survey
Measurement procedures (if any):	Detailed survey will be conducted
Monitoring Frequency	Annually
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	-

Data / Parameter:	$N_{ck,q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of cleaning kits consumed by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y*
Source of data:	Project Sample Group Survey
Measurement procedures (if any):	Detailed survey will be conducted
Monitoring Frequency	Annually
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	The following values should be used depending upon the collection of kits. (1) In case collection of cleaning kits is not done, it is the number of cleaning kits consumed by consumers in income group *(q)* of segment *(p)* in project area *(i)* in year *y* (2) In case collection of cleaning kits is done, it is the number of cleaning kits collected from the consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y*

Data / Parameter:	~~N_{in}~~ $N_{un\text{-}exh,q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of ~~in-~~non-exhausted cleaning kits by consumers of income group *(q)* of segment *(p)* in project area *(i)* in year *y*
Source of data:	• PSG Survey (in case collection of cleaning kits is not undertaken); • Actual monitoring (in case collection of cleaning kits is undertaken)
Measurement procedures (if any):	-
Monitoring Frequency	Annually
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	-

Data / Parameter:	$N_{ndw,q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of cleaning kits used for non-drinking purpose by consumers in the income group *(q)* of segment *(p)* in project area *(i)* in year *y*
Source of data:	PSG Survey
Measurement procedures (if any):	-
Monitoring Frequency	Annually
QA/QC Procedures	As per standard internal quality control parameters e.g.: ISO 9001, 14001
Any comment:	-

Data / Parameter:	$n_{x,q,p,i,y}$
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Number of cleaning kits sold to household x in the income group *(q)* of segment *(p)* in project area *(i)* in year *y*
Source of data:	PSG Survey
Measurement procedures (if any):	-
Monitoring Frequency	Annually
QA/QC Procedures	-
Any comment:	-

Data / Parameter:	Check for public distribution system providing SDW
Data unit:	(Dimensionless) ~~Number/year~~
Description:	Annual checks to determine whether new public distribution system providing SDW has been introduced in the area. Annual checks of the water samples in the project area *(i)*
Source of data:	Project Sample Group Survey
Measurement procedures (if any):	Detailed survey will be conducted
Monitoring Frequency	Annually
QA/QC Procedures	-
Any comment:	Annual checks of the water samples in the project area *(i)* should be conducted by the project participants to assess 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 made for project area *(i)*

Appendix A: Additional Guidance on Surveys

The results of the robust sample survey through questionnaire form the basis of the baseline emissions. While designing the sample survey and arriving at the baseline emissions, the following additional guidance should be followed.

While conducting a sample survey the following steps in conducting a successful survey should be followed:

Sr. No.	Steps	Relevance for methodology
1.	Identify the research objectives	The main objective of the sample survey is the identification of baseline, which is the identification of safe drinking water technology/method adopted
2.	Identify and characterize target audience	The proposed methodology is applicable to households and hence the target audience should include households present in the project area *(i)* as defined by the project participants
3.	Design a sampling plan	The sampling plan should be devised to ascertain that the sample population is representative of the total population. The number of samples should be decided accordingly to include and take into account the variability in the population. The sample size is decided as per the Cochran's formula. The systematic random sampling plan should be adopted as discussed in the baseline emissions section
4.	Design and write the questionnaire	The proposed methodology suggests sampling be conducted for baseline as well as project sample group. For the two different groups a comprehensive questionnaire (sample formats are given in Appendix B and C) should be developed which should be further linked to the BSG and PSG data for the purpose of monitoring
5.	Use questionnaire, analyze results and write report	The questionnaire designed should then be used to collect data/information of sample groups and the available results should be analyzed and reported

Appendix B: Sample format for survey questionnaire for Baseline Sample Group (BSG)

BSG Survey (Please refer baseline emissions section of methodology for details on this)**:**

Objective: A primary market research of BSG would be conducted to establish baseline emission factor for the GHG emissions due to different water purification methods.

Questionnaire: An objective questionnaire would be designed as per guidance provided in this appendix.

Methodology of conducting the BSG survey:

(a) Population: Region (Project area);

(b) Sampling Frame: Electoral register, government approved census / directory or equivalent available government information;

(c) Sampling Unit: A household;

(d) Mode of data collection: Personal in home survey;

(e) Sampling Method: Systematic random sampling;

(f) Sample Size: The sample size is determined using Cochran formula for categorical and dichotomous variables in case of large or infinite population;

(g) Sampling Plan:

(1) The entire population is divided into different project areas (*i*). The stratification of project areas (i) is carried out as per methodology;

(2) Systematic random sampling involves the selection of elements from an ordered sampling frame and adopts equal-probability method, in which every k^{th} element in the frame is selected, where *k*, the sampling interval (sometimes known as the 'skip'), is calculated as:

- sampling interval k= population size (N) /sample size (n).

(h) Select the sample: Carry out office and fieldwork necessary for the selection of the sample.

HOUSEHOLD PROFILE

Date of survey

Name: _____ **Gender:** Male Female

Address: _____ **Age:** _____

_____ **Mobile No.** _____

_____ **Landline No.** _____

Nearest landmark _____

Household size: Adults: _____ Children: _____

Household type: Single Nuclear Joint Extended

Household monthly income

Guidance: This information is only used to capture demographic pattern and will not be directly used for analysis of baseline emission factor.

SAFE DRINKING WATER BEHAVIOUR ADOPTED			
(1)	**Drinking water source**	Tap Water Well Borewell	River Tanker Others(please specify): _____
Guidance: The above question is to identify the source of **drinking water**. This will help to understand drinking water quality parameters like total suspended solids, total dissolved solids, hardness, etc.			
(2)	**Method of obtaining safe drinking water**	Packaged water Boiling UV Filtration Zero energy water purifier	Reverse Osmosis Ozonation Electricity based purification No treatment
Guidance: The above question is to understand the prevalent method used by **household** to obtain **SDW**. This will help to evaluate the baseline emission factor. The question is related to the method used by the household prior to the start date of the project activity.			
(3)	**If boiling is used to get safe drinking water, provide details of type of fuel used for boiling**	LPG Piped gas Coal Biomass (including its type)	Kerosene Electricity Others(please specify):_____
Guidance: If boiling is used to get **safe drinking water**, the above question will provide the answer on type of fuel used to get **SDW**			
(4)	**If boiling is used to get safe drinking water, provide details on average time the water is boiled (in minutes).**	2 mins. 5 mins. 10 mins	15 mins. 20 mins.
Guidance: If boiling is used to get **safe drinking water**, the answer to above question will help determine the quantity of fuel, under the laboratory conditions, required to maintain the boiling of water for a given time.			

(5)	**If boiling is used to get safe drinking water, provide details on type of equipment and stove (if applicable) used.**	Equipment Open utensil Kettle with tight cover	Stoves LPG burners Kerosine stove Coal based domestic stove Electric plates Electric emersion rod Electric kettle Other (Please specify)_____	
Guidance: The above question will provide the type of stove/ equipment used to boil the water, to help using the equipment of most conservative efficiency per fuel type or electricity for determining the fuel/ electricity consumption.				
(6)	**Average amount of water consumed for drinking per person per day in the household**	1 ltrs 4 ltrs	2 ltrs 5 ltrs	3 ltrs More than 5 ltrs
Guidance: The above question will provide average quantity of water consumed for drinking per person per household. This would help while **PSG** survey is undertaken to cross verify the amount of water consumed in **PSG** and to identify if there is a major variation. This information will not be directly used in any analysis.				
Surveyed by…….. Date……				

Appendix C: Sample format for the survey questionnaire for Project Sample Group (PSG)

PSG Survey:

Objective: A survey would be conducted on the existing client base to establish project emissions. The consumers included in this group participate in the project activity.

Questionnaire: An objective questionnaire would be designed as per guidance provided in Appendix A

Procedure:

(a) Population: Region (Project area);

(b) Sampling Frame: Existing client database;

(c) Sampling Unit: Households using the cleaning kit;

(d) Sampling Method: Systematic sampling;

(e) Determine Sample Size: The Sample size is determined using Cochran formula for categorical and dichotomous variables in case of finite population;

(f) Sampling Plan:

(1) The entire population is stratified as per the methodology;

(2) Systematic sampling involves the selection of elements from an ordered sampling frame and adopts equal-probability method, in which every k^{th} element in the frame is selected, where k, the sampling interval (sometimes known as the 'skip'), is calculated as:

- sampling interval k= population size (N) /sample size (n).

(g) Select the sample: Carry out office and fieldwork necessary for the selection of the sample.

Signature _____

Date _____

Project Area Number: _____

Respondent Number: _____

Purifier ID: _____

No. of cleaning kits sold: _____

HOUSEHOLD PROFILE

Name: _____ **Gender:** Male Female

Address: _____ **Age:** _____

_____ **Mobile No.** _____

_____ **Landline No.** _____

Nearest landmark _____

Household size: Adults: _____ Children: _____

Household type: Single Nuclear Joint Extended

Household monthly income _____

Guidance: This information is only used to capture demographic pattern and will not be directly used for analysis.

SAFE DRINKING WATER BEHAVIOUR ADOPTED			
(1)	**Drinking water source**	Tap Water Well Borewell	River Tanker Others(please specify): _____
Guidance: The above question is to identify the source of drinking water. This will help to understand drinking water quality parameters like total suspended solids, total dissolved solids, hardness etc. This will ensure that the zero energy water purifier would provide SDW for any type of input water source			
(2)	**Is the purified water used for other applications (cooking, washing vegetables, cleaning , etc)**	Yes	No
Guidance: This will assess if the purified water was used for any other non drinking application.			
(3)	**If the answer to 3) is yes, then please provide the frequency of such usage in other applications.**	Rarely (once a year) Occasionally (once a month)	Frequently (once a week) Regularly (every day)
Guidance: This will assess the frequency of purified water used for any other non drinking application. Follow the guidance in methodology to determine this factor.			
(4)	**Have you received a free replacement of a full cleaning kit with all the components due to failure of the cleaning kit**	Yes	No
Guidance: This will assess the number of cleaning kit distributed free as replacement and hence CERs would not be considered for these cleaning kits			
(5)	**Have you received free cleaning kit from the company in last 1 year under any promotional offer**	Yes	No
Guidance: This will assess the number of cleaning kit distributed free by the Project participants as promotional offer and hence CERs would not be considered for these cleaning kits			

(6)	**If the answer to 6) is yes, please indicate how many free cleaning kits you received in last year**	1 2 More than 2(please specify):_____
Guidance: This will assess the number of cleaning kit distributed free by the Project Participants as promotional offer and hence CERs would not be considered for these cleaning kits		
(7)	**In the last one year, have you bought more than one cleaning kit in a single purchase**	Yes No
(8)	**If the answer to (8) is yes, how many of them are still unconsumed**	1 Other(please specify): _____
Guidance: This will highlight any discrepancy on extra cleaning kit sold but not used by the household. This will also be verified by the cap applicable on the cleaning kit for which emission reductions are considered.		
(9)	**Have you changed the cleaning kit before reaching 100% of red indicator**	Yes No
(10)	**If the answer to 10) is yes, how many cleaning kits have not been exhausted completely.**	1 2
Guidance: This will help to assess $f_{exh,q,p,i}$. For each cleaning kit, where the cleaning kit is not exhausted, only 50 % of the capacity of the cleaning kit would be considered for CER estimation.		
(11)	**For drinking, do you still boil water (roll boiling)after it has already been purified for a period of time of boiling**	Yes No
Guidance: If the answer to the above question is yes, the emission reductions would be assumed zero for that particular cleaning kit		

FAMILY HEALTH HISTORY			
(1)	**No. of family members who fell ill last year because of water borne diseases like cholera, diarrhea, jaundice, typhoid, etc.**	All One	More than one None
(2)	**Frequency of illness due to the above diseases**	Once in 3 months Once in 9 months	Once in 6 months Once in 12 months

Surveyed by…….. Date……

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History of the document

Version	Date	Nature of revision(s)
01.1.0	EB 58, Annex 5 26 November 2010	Revision to improve the clarity and correct the units of several parameters.
01	EB 53, Annex 5 26 March 2010	Initial adoption.
Decision Class: Regulatory **Document Type**: Standard **Business Function**: Methodology		