GLOBAL CARBON COUNCIL

Driving Climate Actions

Methodology for Desalinated Water Savings in Buildings

GCCM005

V1.0 - 2023

CONTENTS

1. Baseline and Monitoring Methodologies of GCC

1. Global Carbon Council (GCC) is MENA region's first and only voluntary carbon offsetting program that aims to contribute to a vision of sustainable and low carbon economy of the region and help to catalyse climate actions on the ground. Refer www.globalcarboncouncil.com for details.

2. GCC methodologies facilitate the project owners of eligible greenhouse gas (GHG) reduction projects to calculate emission reductions of their projects, monitor the emission reductions and develop the project submission.

3. This methodology is for project activities implementing technologies and measures for desalinated water savings at the consumers side, where the consumers are connected to a water grid that is supplied with water produced by desalination plants and via the water grid the water is transmitted to end users. Desalination of water unlike other water treatment methods has high carbon footprint associated with fossil fuel use in the desalination process, which is the reason for including only desalinated water in the scope of the methodology.

2. Source/s of this Baseline and Monitoring Methodology

4. For the development of GCC methodologies, the requirements of the 'GCC Program Manual' (paragraphs 43-46) and 'Standard for Development of Methodologies' are applied. The determination of baseline scenario and baseline emissions are consistent with UNFCCC's Clean Development Mechanism (CDM) guideline "Guideline for determining baseline for measure/s" (Baseline Guideline) referred in the above standard.

5. This methodology also refers to the latest approved versions of the following GCC methodologies and tools and guidelines of CDM:

   a) GCCM001: "Methodology for Renewable Energy Generation Projects Supplying Electricity to Grid or Captive Consumers";
   b) GCCM002: "Methodology for Energy Saving in Pumping Systems";
   c) GCCM004: "Methodology for Water Grid Connected Renewable Energy Based Desalination Plant";
   d) CDM TOOL 02: "Combined tool to identify the baseline scenario and demonstrate additionality";
   e) CDM TOOL 03: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";
   f) CDM TOOL 05: "Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation";
   g) CDM TOOL 07: "Tool to calculate the emission factor for an electricity system";
   h) CDM TOOL 09: "Determining the baseline efficiency of thermal or electrical energy generation systems";
   i) CDM TOOL 10: "Tool to determine the remaining lifetime of equipment";
   j) CDM TOOL 14: "Project and leakage emissions from anaerobic digesters";
   k) CDM TOOL 16: "Project and leakage emissions from biomass";
   l) "Guidelines for sampling and surveys for CDM project activities and programmes of activities";
   m) "Standard for sampling and surveys for CDM project activities and programmes of activities".

3. Description of key terms

6. Following description of key terms apply to the projects using this methodology:

Sr. No.	Key Term	Description
1	Water grid	Water grid is a water distribution network that supplies desalinated water to the end users
2	Desalination	Desalination is a process that removes salty and mineral components from saline water. Desalination processes are usually driven by either thermal (in the case of distillation) or mechanical (e.g. in the case of reverse osmosis) energy types
3	Gross floor area (GFA)	Gross floor area is the area occupied within external walls and partitions of a building unit. If a building unit contains common service areas in its physical boundary (meeting rooms, corridors, lift wells, plant, and machinery, etc.), include GFA of the common service areas. Otherwise, GFA of the common service areas shall be excluded
4	Residential building	A building should be regarded as a residential building when more than half of the gross floor area is used for dwelling purposes
5	Institutional building	Institutional building means a building intended for public use to provide health, educational, recreational, or government services, and specifically includes schools, hospitals, restrooms, places of worship and government offices
6	Commercial building	Commercial building means a building intended for commercial use if at least 50 percent of its gross floor area is used for commercial activities, such as the exchange of goods and/or services for a profit e.g., retail, food service
7	Grey water	Grey water is all wastewater generated in households or office buildings from showers, baths, basins and washing machines - streams without faecal contamination
8	Treated sewage effluent	Treated sewage effluent means the treated liquid product derived from the Sewage treatment process of the Sewage Treatment Plant that is suitable for re-use for a purpose other than human consumption
9	Water conveyance	Water conveyance refers to the transport of untreated water through aqueducts, canals, and pipelines from its source to the Water desalination/treatment plant
10	Water distribution	Water distribution refers to the transport of treated water from the water desalination/treatment plant to end users

4. Applicable Project Activities and their Eligibility Conditions

7. The project activities eligible under this methodology aim to implement technologies and measures for desalinated water savings at the consumers side, where the consumers are connected to a water grid that is supplied with water produced by desalination plants and via the water grid the water is distributed to end users.

8. This methodology is applicable to project activities that implement desalinated water saving measures in new or existing residential, commercial, or institutional buildings.

9. Examples for typical project activities can be direct installation of low-flow water saving devices in residential, commercial or institutional buildings (low-flow showerheads, kitchen faucets, bathroom faucets, etc.), installation of water saving household appliances in buildings (washing machines, dishwashers, etc.), building smart water management systems for reducing water consumption and avoiding emissions of carbon dioxide associated with conveyance, desalination and distribution of water. In case of retrofit project activities including the installation of new water savings household appliances or devices the old equipment shall be destroyed/scrapped.

10. Examples of project activities can be recycling of grey water for laundry and toilet flushing, and irrigation of landscape parts within building boundaries, recycling, and re-use of treated sewage effluent for non-potable purposes in the buildings and buildings' landscape and gardens, parks provided specific water quality requirements are met applicable to the respective water use, as well as reducing water pipeline leakages within the project boundary.

11. Project owners should clearly describe in the PSF whether a proposed project activity involves the construction of new buildings, retrofitting existing one or the combination of both (construction new and retrofitting existing buildings) and the proposed measures to be implemented under the project activity.

12. The methodology is applicable to project activities aiming at reducing the water consumption or recycling the used (grey) water or utilization of treated sewage effluent under following conditions:

- There shall be an established water grid to supply water to end users and all the desalination plants and end users are connected to this water grid.
- Retrofit project activities, as well as new constructions (Greenfield) project activities are applicable under this methodology.
- Entire water quantity for which the emission reductions are claimed shall be from water desalination technology, either thermal (e.g., MSF) or mechanical (e.g., Reverse Osmosis).
- Building units eligible for applying the methodology shall belong to residential, commercial, and institutional categories as per the provided definitions.
- When computerised simulation tools are employed to estimate water consumption of the whole building, only those computerised simulation tools that have successfully met the analytical verification and have established empirical validation requirements shall be permitted to be used with this methodology. For example, GSAS Trust Water

suite [1] can be applied among other well established regional/ global equivalent software model. In addition, project participants shall demonstrate that the building water consumption simulations and related calibrations have been performed by skilled operator(s) as demonstrated by having at least three years of relevant experience and professional education and/or training and that all required data as per the applied model are available.

13. In case the residual waste from the sewage effluent treatment system is handled aerobically and submitted to soil application, the proper conditions and methods for storage and transportation and soil application must be adhered to ensure that these processes do not result in methane emissions. The project owners shall describe in the PSF how aerobic conditions are met for the residual waste /sludge from the sewage effluent treatment system.

14. Project activity delivers recycled grey water or treated sewage effluent water of quality conforming to local standards applicable to the respective intended use of the water under the project.

15. The low-flow water saving devices shall contain integral, non-removable flow restrictions. The low-flow water saving devices shall provide an equivalent level of service to baseline devices and have minimum of a one-year warranty[2]. The project owner shall demonstrate in the PSF that the project equipment has comparable service characteristics as the baseline equipment.

16. The manufacturers of the project water saving household appliances shall be at the minimum ISO 9001 certified to ensure the reliability of appliances' performance and all serial numbers and model numbers for each project water saving household appliances shall be documented at the time they are disseminated. The appliances must be national eco-design qualified appliances e.g., energy star qualified appliances[3] or compliant with regional/international eco-design requirements[4].

17. This methodology is applicable to project activities where the impact of the measures implemented (reduction in water consumption) by the project activity can be clearly distinguished from changes in water use due to any other measures which are not the part of the project activity, which shall be demonstrated in the PSF.

18. The PSF shall document how the potential for double counting of emission reductions are avoided, for example equipment manufacturers claiming credit for emission reduction for project activities in addition to Project Owner's claim. The water saving technologies/applications may replace existing equipment or be installed in new buildings and shall not been transferred from another location, resulting into increase in water consumption elsewhere.

[1] Further information regarding GSAS TRUST Water suite can be found following the link https://gsas.gord.qa/water-suite/

[2] At a minimum warranty shall cover free replacement or repair of any low-flow devices with equivalent devices.

[3] E.g., meet the criteria established by U.S Environmental Protection Agency

[4] E.g. compliant with Regulation on eco-design requirements for washing machines and washer-dryers (EU) 2019/2023

19. For greenfield project activities the baseline buildings must have been built in compliance with all applicable building standards (e.g., building codes) that are assumed to be enforced[5,6] in the applicable jurisdiction.

20. The applicability conditions included in the methodological tools referred to above shall apply when these tools are used.

5. Sectoral Scope applicable to GCC verifier

21. The sectoral scopes eligible under GCC have been defined in section 3.2 of 'Standard for Development of Methodologies'.

22. Only a third-party verifier approved under GCC for the sectoral scope 3: Energy demand can conduct Project Verification or Emission Reduction Verification of GCC project that applies this methodology.

6. Project Boundary

23. The spatial extent of the project boundary encompasses the desalination plant(s)/unit(s), connected physically to the water grid, the installations from the feed water capture to storage of desalinated water, sewage treatment plant, pump sets for transmission and distribution of water via the water grid and end users connected to the water grid.

The GHGs included in or excluded from the project boundary are listed in Table 1.

Table 1: Emission sources included in or excluded from the project boundary

Source		GHG	Included	Justification/explanation	Determination of Emissions
Baseline emissions	CO_2 emissions due to the thermal and electrical energy consumption for water conveyance in the baseline	CO_2	Yes	Main emission source	As described in baseline emission section below
		CH_4	No	Minor emission source	
		N_2O	No	Minor emission source	
	CO_2 emissions due to the thermal and	CO_2	Yes	Main emission source	As described in baseline emission section below

[5] Greater than 50% of buildings built comply with building energy codes and standards.

[6] The requirements in this paragraph are assumed to be determined, ex-ante, by observation or review of public records and not by baseline buildings occupant surveys.

	electrical energy consumption for water desalination in the baseline	CH_4	No	Minor emission source	
		N_2O	No	Minor emission source	
	CO_2 emissions due to the thermal and electrical energy consumption for water distribution in the baseline	CO_2	Yes	Main emission source	As described in baseline emission section below
		CH_4	No	Minor emission source	
		N_2O	No	Minor emission source	
Project emissions	CO_2 emissions due to the electrical energy consumption for water conveyance, additional water treatment of recycled water and distribution in the project activity	CO_2	Yes	Main emission source	CDM Tool 05: "Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"
		CH_4	No	Minor emission source	
		N_2O	No	Minor emission source	
	CO_2 emissions due to the fossil fuel combustion for water conveyance, additional water treatment of recycled water and distribution in the project activity	CO_2	Yes	Main emission source	CDM Tool 03: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
		CH_4	No	Minor emission source	
		N_2O	No	Minor emission source	
	Project emissions associated with the anaerobic digester	CO_2	No	Minor emission source	
		CH_4	Yes	Main emission source	CDM Tool 14: "Project and leakage emissions from anaerobic digesters"
		N2O	No	Minor emission source	

7. Baseline Scenario

24. The baseline scenario shall be determined following the CDM Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality" given that the outcome for the most plausible baseline scenario is as follows:

25. For existing buildings, the rationale as per CDM "Guidelines for determination of baselines for measure(s)"[7] is that most plausible scenario should be that the building would continue to consume water at historical level in absence of the project activity. Therefore, the historical quantity of desalinated water would be supplied via the water grid to the end users. For new buildings the baseline is set at a water consumption of the similar building types.

26. Hypothetically it means that saved desalinated water results in emission reductions proportional to the carbon intensity of the saved water, as well as emission reductions due to saving in energy for conveyance and distribution of the reduced desalinated water.

7.1 Retrofitting existing buildings

27. For retrofitting existing buildings, relevant existing pre-retrofit building characteristics should be demonstrated to be the baseline scenario following the latest version of CDM Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality". The approach to estimate baseline emissions of existing buildings prior to their retrofit is described in the section "Baseline emissions" below.

7. 2 Construction of new buildings

28. The baseline scenario for newly constructed buildings is derived from the building units constructed and then occupied within the last three years prior to project commissioning. Baseline should be derived for each building unit category. The approach to estimate baseline emissions of new buildings is described in the section "Baseline emissions" below.

8. Additionality

29. Project participants shall apply the latest version of CDM Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality".

8.1 Retrofitting existing buildings

30. Additionality of the project activity dealing with retrofitting of existing buildings shall be demonstrated with the use of the latest approved version of the CDM Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality". If Step 3. Investment analysis: Investment comparison analysis is applied; the analysis shall be conducted for the entire set of measures (not for an individual measure) planned to be implemented in a specific building type in the course of the project activity. When investment analysis is conducted for measures aimed at replacing existing equipment with new equipment or retrofitting existing equipment, the remaining lifetime of the baseline equipment shall be determined using the latest approved version of the CDM Tool 10: "Tool to determine the remaining lifetime of equipment".

31. Common practice analysis of the latest approved version of the CDM Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality" shall be conducted for each individual measure in the set of measures planned to be implemented in each building category. If, as the outcome of the common practice analysis, a particular measure is regarded to be common practice, then the water consumption performance of this measure needs to be included in the baseline determination.

[7] https://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid50.pdf

8.2 Construction of new buildings

Additionality of the project activity dealing with new construction shall be demonstrated only for water saving measures applied in the project activity. This approach requires using the latest approved version of the CDM Tool 02: "Combined tool to identify the baseline scenario and demonstrate additionality". The alternatives for the assessment of the baseline scenario shall, at least, include the proposed project activity implemented without carbon credits and an alternative design of the project building that would have been built considering the building water consumption performance obtained from surveys of construction companies or experts.

9. Baseline emissions

32. Baseline emissions in year y are the emissions associated with the desalinated water consumption of end users, water conveyance and water distribution[8] of the water quantity used in the absence of the project activity. The baseline emissions are estimated as per the equation below:

Equation (1)

$$BE_y = (\underset{k}{\underset{jj}{\text{}}}QQ_{W,BL,y,jj} \times f_{autonom\ imp} \times (EF_{WG,CCCNV,BL,y,k} + EF_{WG,DIST,BL,y.k}) + \underset{jj}{\text{}}(QQ_{W,BL,y,jj} \times f_{autonom\ imp} - QQ_{W.PJ,y,jj}) \times EF_{WG,SAMPLE,y})$$

Where:

BE_y	=	Baseline emissions due to baseline consumption of desalinated water by end users in year y (tCO_2)
$QQ_{W,BL,y,jj}$	=	Quantity of desalinated water used in the baseline in building of type j in year y (m^3)
$QQ_{W,PJ,y,jj}$	=	Quantity of desalinated/recycled grey treated sewage water consumed in the project in building type j (m^3)
$EF_{WG,SAMPLE,y}$	=	Emission factor of build margin sample group of desalination plants in the water grid in year y (tCO_2/m^3) estimated as per the option 2 (ex-post) of GCCM004 "Methodology for Water Grid Connected Renewable Energy Based Desalination Plant"
$EF_{WG,CCCNV,BL,y,k}$	=	Emission factor of different types of Conveyance Systems k in the water grid in year y (tCO_2/m^3)
$EF_{WG,DIST,BL,y,k}$	=	Emission factor of different types of Water Distribution Systems k in the water grid in year y (tCO_2/m^3)

[8] In cases where the baseline and project conveyance and distribution systems are the same and data are not available because these systems are out of control of the project owner, the baseline and project emissions associated with water conveyance and distribution may be ignored, as they cancel each other out.

$f_{autonom\ imp}$	=	Autonomous improvement factor Option 1: Default value of 0.98 Option 2: Based on statistics for decrease of the water consumption per person per capita or other verifiable information e.g., local requirements for limit on the water usage per capita

9.1 Calculation of emission factor of build margin desalination plants in the water grid

33. The project activity will save the water that would have been supplied in the water grid by connected desalination plants. The emission factor of build margin desalination plants in water grid ($EF_{WG,SAMPLE,y}$) shall be calculated as per the Option 2 (ex-post) of relevant procedure in latest version of the GCCM004 "Methodology for Water Grid Connected Renewable Energy Based Desalination Plant".

9.2 Calculation of emission factor of different types of conveyance systems in the water grid

34. The emission factor of different types of conveyance systems can be determined based on the specific energy consumption of the source pumping in the water grid as follows:

$$EF_{WG,CCCNV,BL,y,k} = SEC_{WG,CCCNV,BLk} \times EF_{GRID,y}/10^3 \qquad \textit{Equation (2)}$$

Where:

$SEC_{WG,CCCNV,BL,k}$	=	Specific energy consumption of different types of Conveyance Systems k (kWh/m^3) **Option 1:** Specific energy consumption of baseline water conveyance system can be determined using a Default value[9] as follows: 0.029 (kWh/m^3) for Pumped Local Conveyance. 0.79 (kWh/m^3) for Pumped Long Distance Conveyance (long distance is defined as a minimum of 200 km for systems requiring pumping over the length of conveyance with little gravity usage; 0 (kWh/m^3) for 100% Gravity-Based System. **Option 2:** Specific energy consumption of baseline water conveyance system can be determined following the respective procedures as per GCCM002 "Methodology for Energy Saving in Pumping Systems" (please refer to SEC_{BL}).

[9] Default values are based on International Financial Institutions Technical Working Group on Greenhouse Gas Accounting (2020), "Default Energy Intensity Factors for Water Supply Systems" found at https://unfccc.int/sites/default/files/resource/AHSA-004_Default%20Energy%20Intensity%20Factors%20for%20Water%20Supply%20Systems_v1.pdf

$EF_{GRID,y}$	=	Grid Emission factor in year y (tCO2/MWh). Calculated following the respective procedures as per Section 9 "Baseline emissions" of the GCCM001 "Methodology for Renewable Energy Generation Projects Supplying Electricity to Grid or Captive Consumers".

9.3 Calculation of emission factor of different types of water distribution systems in the water grid

35. The emission factor of different types of distribution systems can be determined based on the specific energy consumption of the source pumping in the water grid as follows:

$$EF_{WG,DIST,BL,y,k} = SEC_{WG,DIST,BL,k} \times EF_{GRID,y}/10^3 \qquad \textit{Equation (3)}$$

Where:

$SEC_{WG,DIST,BL,k}$	=	Specific energy consumption of different types of Baseline Water Distribution Systems k (kWh/m^3) **Option 1:** Specific energy consumption can be determined using a Default value as follows (as per the source of footnote 9): 0.14(kWh/m^3) for Pumped Distribution. 0 (kWh/m^3) for 100% Gravity-Based System; **Option 2:** Specific energy consumption can be determined following the respective procedures as per GCCM002 "Methodology for Energy Saving in Pumping Systems" (please refer to SEC_{BL}).
$EF_{GRID,y}$	=	Grid Emission factor in year y (tCO_2/MWh). Calculated following the respective procedures as per Section 9 "Baseline emissions" of the GCCM001 "Methodology for Renewable Energy Generation Projects Supplying Electricity to Grid or Captive Consumers".

9.4 Calculation of the baseline water consumption $QQ_{W,BL,y,jj}$

9.4.1 Retrofitting existing buildings

36. For project activities involving the retrofit of an existing building, the baseline water consumed is the average water quantity consumed by the existing buildings over the last 3 years prior to the start date of the project activity.

37. Sampling can be used to determine ex-ante the baseline water quantity consumption. Similar building units included in the sample are to be defined according to paragraph 40 (b) to (h) below. The latest version of the "Standard: Sampling and surveys for CDM project activities and programme of activities" and the "Guideline: Sampling and surveys for CDM project activities and programmes of activities" shall be followed[10].

[10] When determining the sample size, project participants may define the sample size, strata and clusters based on the variability of different building features

9.4.2 Construction of new buildings

38. The baseline water consumption by new buildings shall be determined by one of the following two options:

Option 1: Baseline quantity of water consumed may be determined through a sample-based measurement in similar buildings chosen in accordance with paragraph 40 below.

Option 2: Baseline quantity of water consumed may also be determined through computer simulation modelling that meet the conditions below:

(a) it has successfully met the analytical verification and empirical validation requirement as defined in scientifically recognized protocols or in a comparable international or national standard (e.g., GSAS Water suite or any other applicable regional/global software model); or

(b) it is publicly available and peer-reviewed scientific studies have acknowledged that it successfully simulates the water consumption of residential buildings.

39. To determine the baseline water consumption through computer simulation modelling, the following requirements apply:

(a) If there is a legally mandated code on water use and/or equipment performance standard(s), the inputs to the computer simulation tool shall be based on minimum water requirements in the building code and/or equipment performance standard(s) for the subject building type(s) or classification(s).

(b) If there is neither legally mandated building code nor equipment performance standard(s) on water consumption, the baseline water quantity that would have been consumed by the baseline building used for the computer simulation tool shall be based on:

i. An engineering/ scientific study provided by a construction company or expert (e.g., a third-party architect or Chartered Engineer).

ii. An existing building unit that has a sample /control group of the similar project end users/units as per the below:

9.4.3 Sample/Control group of Similar Project End Users/ Units

40. The similar buildings referred to in paragraph 37, paragraph 38 option 1 and paragraph 39 (b), (ii) are to be chosen meeting the following requirements:

(a) Building has been constructed less than 3 years prior to the start date of the project activity.

(b) Building is used for the same purpose as the project building unit.

(c) For residential building units, the building unit's j average number of occupants per year $Occupancy_{jj,y}$ during the crediting period is between ±20% of the average baseline building unit's j occupancy $Occupancy_{jj,BL}$ over the last 3 years prior to the start date of the project activity;

(d) For commercial and institutional building units, the average yearly operating hours $H_{CCP,y}$ of the unit j is at least 30 hours/week.

(e) Building has a Gross Floor Area (GFA) of ±20% of the project building unit.

(f) Building has similar height or number of floors (low-rise or high-rise).

(g) Building is located in the same region under same climatic and geographic conditions with a similar micro-climate (e.g., similar average rainfall, wind, and temperature). If there are no new similar units in the region, select a similar unit from a region with average temperature and humidity within ±10% of the average temperature and humidity of the region of the project unit.

(h) Building is occupied by residents of a similar socio-economic class.

10. Project Emissions

41. Project emissions correspond to those generated by the project water conveyance, additional treatment (aerobic or anaerobic) for recycled grey/treated sewage water and water distribution systems. In case the sewage water treatment plant uses anaerobic water treatment method the methane emissions shall be accounted for.

42. Project emissions due to electricity supplied by an electricity grid are calculated as follows:

$$PE_y = (EG_{WATER\ TREAT,PJ,y} + EG_{WG,CCCNV,PJ,y} + EG_{WG,DISTR,PJ,y}) \times EF_{GRID,y} + PE_{SEWAGE\ TREAT,y} \quad \textit{Equation (4)}$$

Where:

$EG_{WATER\ TREAT,PJ,y}$	=	Electricity consumption for the additional treatment of recycled grey / re-used treated sewage water in year y (MWh)
$EG_{WG,CCCNV,PJ,y}$	=	Electricity consumption of the project water conveyance system in year y (MWh)
$EG_{WG,DIST,PJ,y}$	=	Electricity consumption of the project water distribution system in year y (MWh)
$EF_{GRID,y}$	=	CO_2 emission factor of the electricity grid in year *y* (tCO_2/MWh) Calculated following the respective procedures as per Section 9 "Baseline emissions" of the GCCM001 "Methodology for Renewable Energy Generation Projects Supplying Electricity to Grid or Captive Consumers".
$PE_{SEWAGE\ TREAT,y}$	=	Project emissions due to anaerobic sewage water treatment, tCO_2

43. In cases where the baseline and project water conveyance systems are the same and real time measurement of the electricity consumption of the water conveyance system cannot be implemented the project emissions and baseline emissions due to water conveyance can be ignored.

44. In cases where the baseline and project distribution systems are the same and real time measurement of the electricity consumption of the water conveyance system cannot be implemented the project emissions and baseline emissions due to water distribution can be ignored.

45. In case of fossil fuel use the emissions from fossil fuel combustion by the project activity for conveyance, distribution, and additional treatment of recycled grey/ re-used treated sewage water are calculated in accordance with the latest approved version of CDM Tool 03: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

46. In cases where the sewage effluent is treated anaerobically the project emissions from anaerobic treatment of sewage effluent ($PE_{SEWAGE\ TREAT,y}$) are calculated as per the

latest version of the CDM Tool 14: "Project and leakage emissions from anaerobic digesters ".

11. Leakage Emissions

47. There are no leakage emission sources associated with the project activities under this methodology.

12. Emission Reductions

48. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \qquad \textit{Equation (5)}$$

Where:

ER_y = Emission reductions in year *y* (tCO_2e)

BE_y = Baseline emissions in year y (tCO_2)

PE_y = Project emissions in year y (tCO_2)

13. Monitoring Methodology

13.1 Parameters <u>not</u> monitored during the crediting period

Data / Parameter Table 1.

Data / Parameter:	$SEC_{WG,CONV,BL,k}$
Data unit:	kWh/m^3
Description:	Specific electric energy consumption of baseline water conveyance system prior to implementation of GCC project
Source of data:	Option 1: Default values: 0.029 (kWh/m^3) for Pumped Local Conveyance. 0.79 (kWh/m^3) for Pumped Long Distance Conveyance (long distance is defined as a minimum of 200 km for systems requiring pumping over the length of conveyance with little gravity usage. 0 (kWh/m^3) for 100% Gravity-Based System. Option 2: Option 2.1 monitoring records of baseline period or Option 2.2 data from manufacturer's specifications
Measurement procedures (if any):	Option 2.1: Calculated using EC_{BL} and BL (refer equation 2 of GCCM002 "Methodology for Energy Saving in Pumping Systems") Option-2.2: Calculated using pump manufacturer's data (refer equation 4 of GCCM002 "Methodology for Energy Saving in

	Pumping Systems")
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table 2.

Data / Parameter:	$SEC_{WG,DIST,BL,k}$
Data unit:	kWh/m^3
Description:	Specific electric energy consumption of baseline water distribution systems prior to implementation of the GCC project
Source of data:	Option 1: Default values: 0.14(kWh/m3) for Pumped Distribution. 0 (kWh/m3) for 100% Gravity-Based System. Option 2: Option 2.1 metering records of baseline period or Option 2.2 data from manufacturer's specifications.
Measurement procedures (if any):	Option-2.1: Calculated using EC_{BL} and BL (refer equation 2 of GCCM002 "Methodology for Energy Saving in Pumping Systems") Option-2.2: Calculated using pump manufacturer's data (refer equation 4 of GCCM002 "Methodology for Energy Saving in Pumping Systems")
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table 3.

Data / Parameter:	$Occupancy_{jj,BL}$
Data unit:	number
Description:	Occupancy rate of baseline building type j
Source of data:	Register books of each building unit
Measurement procedures (if any):	Established once ex-ante based on records over the last 3 years prior to the start date of the project activity

Quality Procedure:	N/A
Any comment:	

Data / Parameter Table 4.

Data / Parameter:	$Q_{W,BL,jj}$
Data unit:	m^3
Description:	Quantity of desalinated water used in the baseline in building of type j (m3)
Source of data:	Logbooks of the buildings
Measurement procedures (if any):	Established once ex-ante based on records over the last 3 years prior to the start date of the project activity only if the quantity of desalinated water used in the baseline is determined in case of paragraph 36
Quality Procedure:	N/A
Any comment:	

13.2 Parameters for monitoring during the crediting period

Data / Parameter Table M1

Data / Parameter:	$Q_{W,BL,jj}$
Data unit:	m^3
Description:	Quantity of desalinated water used in the baseline in building type j
Source of data:	Baseline building site
Measurement procedures (if any):	This parameter should be monitored using volume flow meters
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording
QA/QC procedures:	The meter should be calibrated periodically based on internal procedure of the project participant and relevant industry standards or national standards

Any comment:	Preferably, the consumption of water from different sources shall be monitored separately This parameter can be determined based on sampling, provided that: • the latest version of the "Standard: Sampling and surveys for CDM project activities and programme of activities" and the "Guideline: Sampling and surveys for CDM project activities and programmes of activities" is followed • only similar building units, defined in paragraph 40, shall be included in one sample. If the project involves building units that do not comply with the definition of similar building units, sampling shall be conducted individually for each different groups of buildings • the average water consumed by the building units included in each sample is multiplied by the number of similar building units to determine the quantity of desalinated water used in the baseline

Data / Parameter Table M2

Data / Parameter:	$EF_{GRID,y}$
Data unit:	t CO_2e/MWh
Description:	CO_2 emission factor of the grid electricity in year *y*
Source of data	Use options to calculate as per GCCM0001 "Methodology for Renewable Energy Generation Projects Supplying Electricity to Grid or Captive Consumers"
Measurement procedures (if any):	CO_2 emission factor for grid connected power generation in year *y* (t CO_2/MWh) determined as per one of the four options below: (i) Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the CDM Tool 07: "Tool to calculate the emission factor for an electricity system"(t CO_2/MWh) of the CDM Or (ii) Latest available emission factor of the Grid in a country as approved by CDM standardized baseline Or (iii) Latest available emission factor of the Grid in a country as approved by its relevant National Authority or Designated National Authority (DNA) under CDM or UNFCCC focal point, in case DNA doesn't exist Or (iv) Latest IFI combined margin emission factors published on UNFCCCwebsite Or (v) Latest published Emission factor derived by International Energy Agency (IEA) (This option can be used only if it is objectively demonstrated that options (i), (ii), (iii) and (iv) above are not available)

Data / Parameter Table M3

Data / Parameter:	$EG_{WATER\ TREAT,PJ,y}$
Data unit:	MWh
Description:	Quantity of electricity consumed for the additional treatment of recycled grey/sewage water in year y (MWh)
Source of data:	Logbooks
Measurement procedures (if any):	This parameter should be monitored by electricity (MWh) meter continuously throughout the year. Where some data is missing for some objectively demonstratable reasons, surrogate data shall be estimated in a conservative manner to replace the missing data by applying the highest energy consumption derived from measured data from the date of start of project
Quality Procedure:	The electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or national requirements. If these standards are not available, and meter supplier does not specify, calibrate the meters every 3 years and use the meters with at least 0.5 accuracy class (e.g. a meter with 0.2 accuracy class is more accurate and thus it is accepted)
Monitoring frequency:	Continuous monitoring and at least monthly recording
Any comment:	

Data / Parameter Table M4

Data / Parameter:	$EG_{WG,CONV,PJ,y,k}$
Data unit:	MWh
Description:	Quantity of electricity consumed of the project water conveyance system k in year y(MWh)
Source of data:	Logbooks

Measurement procedures (if any):	This parameter should be monitored by electricity (MWh) meter continuously throughout the year Where some data is missing for some objectively demonstratable reasons, surrogate data shall be estimated in a conservative manner to replace the missing data by applying the highest energy consumption derived from measured data from the date of start of project
Quality Procedure:	The electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or national requirements. If these standards are not available, and meter supplier does not specify, calibrate the meters every 3 years and use the meters with at least 0.5 accuracy class (e.g. a meter with 0.2 accuracy class is more accurate and thus it is accepted)
Monitoring frequency:	Continuous monitoring and at least monthly recording
Any comment:	

Data / Parameter Table M5

Data / Parameter:	$EG_{WG,DIST,PJ,y,k}$
Data unit:	MWh
Description:	Quantity of electricity consumed of the project water distribution system k in year y(MWh)
Source of data:	Logbooks
Measurement procedures (if any):	This parameter should be monitored by electricity (MWh) meter continuously throughout the year Where some data is missing for some objectively demonstratable reasons, surrogate data shall be estimated in a conservative manner to replace the missing data by applying the highest energy consumption derived from measured data from the date of start of project
Quality Procedure:	The electricity meter will be subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or national requirements. If these standards are not available, and meter supplier does not specify, calibrate the meters every 3 years and use the meters with at least 0.5 accuracy class (e.g. a meter with 0.2 accuracy class is more accurate and thus it is accepted)

Monitoring frequency:	Continuous monitoring and at least monthly recording
Any comment:	

Data / Parameter Table M6

Data / parameter:	$Q_{W,PJ,y,jj}$
Data unit:	m^3
Description:	Quantity of desalinated/recycled grey treated sewage water consumed in the project in building type j
Source of data:	Project activity building site
Measurement procedures (if any):	This parameter should be monitored using volume flow meters
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording
QA/QC procedures:	The meter should be calibrated periodically based on internal procedure of the project participant and relevant industry standards or national standards
Any comment:	-

Data / Parameter Table M7

Data / Parameter:	$Occupancy_{jj,y}$
Data unit:	number
Description:	Occupancy rate of project building type j in year y
Source of data:	Register books of the building
Measurement procedures (if any):	Average occupancy rate for building j in year y based on register book logs or established applying the latest version of the "Standard: Sampling and surveys for CDM project activities and programme of activities" and the "Guideline: Sampling and surveys for CDM project activities and programmes of activities"
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table M8

Data / Parameter:	$H_{OP,y}$
Data unit:	Number of hours
Description:	Average yearly operating hours of project building
Source of data:	Register books of the building

Measurement procedures (if any):	Average yearly operating hours shall be established based on official records
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table M9

Data / Parameter:	$APP\ Number_{OP,y}$
Data unit:	Number
Description:	Number of appliances still in operation
Source of data:	Maintenance register books of the building
Measurement procedures (if any):	Number of appliances for building j in year y based on maintenance register book logs or established applying the latest version of the "Standard: Sampling and surveys for CDM project activities and programme of activities" and the "Guideline: Sampling and surveys for CDM project activities and programmes of activities"
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table M10

Data / Parameter:	$EF_{WG,SAMPLE,y}$
Data unit:	tCO_2/m^3
Description:	Emission factor of build margin sample group of desalinated plants in the water grid
Source of data:	Calculated
Measurement procedures (if any):	Emission factor of build margin sample group of desalination plants in the water grid in year y estimated as per the option 2 (ex-post) GCCM004 "Methodology for Water Grid Connected Renewable Energy Based Desalination Plant"
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table M11

Data / Parameter:	$PE_{SEWAGE\ TREAT,y}$

Data unit:	tCO_2/y
Description:	Project emissions due to anaerobic sewage water treatment, tCO2
Source of data:	Data from sewage effluent treatment site
Measurement procedures (if any):	Calculated as per CDM Tool 14 "Project and leakage emissions from anaerobic digesters "
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table M12

Data / Parameter:	$Soil\ application$
Data unit:	-
Description:	Aerobic soil application of the sludge/ waste residue from the sewage effluent treatment system
Source of data:	Data from the sludge soil application site
Measurement procedures (if any):	Visual observation that the layer of the applied sludge on the soil is between 1 – 5 cm
Quality Procedure:	N/A
Any comment:	

Data / Parameter Table M13

Data / Parameter:	$n_{SCRAP,y}$
Data unit:	Number
Description:	Number of scrapped baseline appliances/devices
Source of data:	Project owners
Measurement procedures (if any):	
Quality Procedure:	Compare the number of distributed project appliances/devices with the number of scrapped baseline appliances/devices
Any comment:	

DOCUMENT HISTORY		
Version	**Date**	**Comment**
V 1.0	23/01/2023	Initial adoption by GCC Steering Committee based on following: i. Consideration by individual steering committee member, followed by evaluation of entire steering committee ii. 15 days global stakeholder consultation taken place between 08/11/2022 to 22/11/2022