



GROUPED PROJECTS FOR CAMBODIA WATER PURIFIER

Sustainability Investment Promotion and Development

Joint Stock Company

(SIPCO)

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The proposed project aims at improving the quality of drinking water through dissemination of low green gas emitting safe drinking water purifier (SDWP) to provide clean drinking water for households in Kingdom of Cambodia. For this reason, this proposed project activity will avoid the use of thermal energy and/or low energy and associated emissions.

The grouped project activity will minimize the use of non-renewable biomass utilized for boiling water as a means purification to achieve safe drinking water quality in the absence of this project activity. This directly leads to reduced greenhouse gas emissions. Furthermore, it can be helpful to user's health.

The project activity targets households in communities with no previous water purifiers access. The geographical boundary is in Cambodia. Water purifiers are distributed free of cost to user. Sustainability Investment Promotion and Development Joint Stock Company (SIPCO) financed the implementation of the project in full.

The scenario existing prior to the implementation of the project is the actual baseline scenario which is equal to the existing common practice by the households i.e. in absence of the project activity the equivalent amount of thermal energy generated using firewood to meet the boiling water demand.

The project activity will distribute water purifiers to households in Cambodia that use woodfuel to boil drinking water. SIPCO will prioritize distribution first to households in rural and remote areas. In urban areas, there is still a hierarchy of rich and poor, so project activities will still be distributed to households in urban areas if those households meet all project criteria.

The project proponent aims to disseminate 26,000 water purifiers in Takeo Province, is in the first project activity instance of this grouped project. The estimates of annual average GHG emission reductions of project activity instance 1 is 43,129 tCO₂e/year. The estimated total emission reductions of project activity instance 1 for 10 years crediting period will be 431,290 tCO₂e.

This project is on registration process. Information of validation period is illustrated below:

Audit Type	Period	Program	VVB Name	Number of years
Validation	10 Jul 2022 is the date of listing (Crediting period: 02 May 2022 to 01 May 2032)	VCS	Carbon Check (India) Private Limited	10

1.2 Sectoral Scope and Project Type

The project activity under consideration is a grouped project activity. The project activity instances as part of the grouped project will have following sectoral scope, project type and methodologies:

Sectoral Scope applicable to project: 03 – Energy Demand

Project type III: Other projects activities not included in Type I or Type II

Methodology: AMS–III.AV - “Low greenhouse gas - emitting safe drinking water production systems”, version 08.0.

1.3 Project Eligibility

As per para 2.1.1 of the VCS Standard, version 4.5, the project is eligible under the scope of the VCS Program because this project activity meets two the scopes of the VCS program:

Elements	Project applicability
1) The six Kyoto Protocol greenhouse gases	The project activity and AMS-III.AV version 08 aims at CO2 reduction of non-renewable biomass
2) Ozone-depleting substances.	N/A
3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process.	N/A
4) Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of Verra approval.	CDM methodology AMS-III.AV version 08 is applied. The CDM is a VCS approved GHG program. Any methodology developed under the United Nations Clean Development Mechanism can be used for projects and programs registering with VCS ¹
5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements	N/A

Further, it cannot reasonably be assumed that the project generates GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction. All the target households involve in this grouped project activity are fully

¹ <https://verra.org/methodologies/>

Finally, project activity reduces the use and demand of non-renewable biomass that would have been used to boil the water. Therefore, the project activity is not excluded by the VCS Program under the circumstances indicated in Table 1 of para. 2.1.3 of the VCS Standard, v.4.5.

1.4 Project Design

- ☐ The project includes a single location or installation only
- ☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project
- ☒ The project is a grouped project

Eligibility Criteria

The inclusion of new project activity instance (PAIs) have to meet the eligibility criteria set out in section 3.6.16 to 3.6.18 of the VCS Standard version 4.5 as tabulated below:

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Meet the applicability conditions set out in the methodology applied to the project.	The new project activity instance will meet all applicability conditions of AMS – III.A.V: “Low greenhouse gas emitting safe drinking water production systems”, version 08.0.	The project activity instance 1 (PA 1) is compliant with the applicability conditions in methodology applied for this project AMS-III.AV “Low greenhouse gas – emitting safe drinking water production systems”. More details are mentioned in Section 3.2 of this PD.
2	Use the Technologies or measures specified in the project description.	The water purification technologies include a low greenhouse gas emitting technology	The WPs distributed within PA 1 are using technology, which is described in details in Section 1.11 (Technology). The ceramic mixed with silver ions (Ag ⁺) to make water filter. This design is to improve drinking water quality and retain essential mineral components.
3	Apply the technologies or measures in the same manner as specified in the project description	Technologies that use fossil fuels are not eligible. Technologies shall meet minimum criteria for specific instance type, as outline below:	The applied technology of WP distributed within PA 1 is described in details in Section 1.11 (Technology).

		- Technologies shall be deployed Natural Osmosis systems with the components illustrated in section 1.11 of this PD - Flow rate: 2 – 3l/hr - Other key features of the design of the systems. Type of service, as well as performance specification based on, inter alia testing/certification: - Each unit must achieve water quality for microbes defined in Drinking Water Quality Standard of Cambodia - Lifespan is 10 years	
4	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	Are installed within the geographic area specified in Section 1.12, thus subject to the same baseline scenario determined in Section 3.3	The project activity 1 is conducted in Takeo province within Cambodia. The information proves the places for distribution will be showed in the monitoring and beneficiary document database
5	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.	The additionality of the project activity is demonstrated by simple cost analysis that is in line with paragraph 10 (a) of Tool21 “Demonstration of additionality of small-scale project activities” (version 13.1) and paragraph 33 and 34 of TOOL01 “Tool for the demonstration and assessment of additionality”. To demonstrate additionality by Simple cost analysis, each project instance shall confirm and demonstrate that the SDWPs are distributed for free to the Users.	PA 1 is eligible when the WPs are distributed for free. The PP have to provide the proof for this point. This point is also confirmed by WPs receivers in beneficiary documents. The additionality of the project activity is described in Section 3.5 of this PD
6	Conditions that avoid double counting of emission	The new project activity instances will:	Each WP within PA 1 is uniquely identifiable and not part of any

	reductions.	Apply a unique system (i.e. conformity letter) for SDWP in each project instance, assigning a unique ID to each SDWP and allowing to clearly identify each SDWP and to which project instance it belongs. Each SDWP installed will include project instance assignment and will have corresponding end user details (i.e. name, address). This data will be recorded as part of the beneficiary agreement and Project database. The CME has an agreement in place with residents who use drinking water from SDWPs in the project instance in which the owner transfers the rights to the emissions reductions exclusively to the CME as part of the Carbon Rights Waiver within the Beneficiary agreement	other GHG Programs registered project or instance of the other grouped project. The WPs will carry unique WPs comprised of the project activity instance number.
7	Capacity Limit	In line para 3.6.9 in VCS Standard version 4.5, where a capacity limit applies to a project activity included in the project, no project activity instance shall exceed such limit. Further, no single cluster of project activity instances shall exceed the capacity limit, determined as follows: 1) Each project activity instance that exceeds one percent of the capacity limit shall be identified. 2) Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometer of at least one other instance in the cluster. Instances that are not within one	PA 1 will distribute no more 26,000 water purifiers and GHG emission reduction is estimated 43,129 tCO₂e/year per an instance, that is not exceeding 60,000 tCO₂e per year in any year of the crediting period. Each water purifier as a PAI and the capacity of project activity instance is well below 1% of the threshold limit. Therefore, it is not required to divide any project activity instance into clusters. Therefore, the criterion is satisfied.

		kilometer of any other instance shall not be assigned to clusters. 3) None of the clusters shall exceed the capacity limit and no further project activity instances shall be added to the project that would cause any of the clusters to exceed the capacity limit	
8	Target group	Each project instance will target end users which includes households who use traditional cookstove to boil drinking water.	PA 1 in Takeo province satisfies the criteria. Each household must sign in a beneficiary agreement to commit that they are using traditional cookstove to boil drinking water.
9	Occur within one of the designated geographic areas specified in the project description	New project activity instances will be located within the geographic boundaries of Cambodia. The new project instances geographic location will be defined in the monitoring reports.	The project activity 1 is conducted in households in Takeo province within Cambodia. The information proves the addresses for distribution will be provided in the monitoring, database and beneficiary document.
10	Conform with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial conformance with multiple sets of eligibility criteria is insufficient	New project activity instances must comply set of eligibility criteria for the inclusion of new project activity instances in the table	The project activity 1 under the grouped project must comply set of eligibility criteria for the inclusion of new project activity instances in this table.
11	Be included in the monitoring report with sufficient technical, financial, geographic, and other relevant information to demonstrate conformance with the applicable set of eligibility criteria and enable evidence gathering by the validation/verification body	New Project Activity Instances must comprise monitoring plans that outline the technical, financial, geographic and other relevant information to enable sampling by the validation/verification body	The information proves the technical, financial, geographic for distribution of the project activity 1 will be provided in the monitoring period to DOE
12	Be included in an updated project description, with updated project location information, which shall be validated at the time of	New project activity instances must comprise an updated project description, with updated project location information.	The information proves project location information for distribution the project activity 1 will be provided in the monitoring period to DOE

	verification against the applicable set of eligibility criteria.		
13	Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).	New PIs will demonstrate ownership by the project proponent, from the start date of the PI	The project activity 1 under the grouped project will confirm about ownership by agreements between SIPCO and the manufacturer before start date of PI; and beneficiary agreements between SIPCO and end-users
14	Have a start date that is the same as or later than the grouped project start date.	Only PIs having a start date that is the same as or later than the GP start date will be included in the grouped project.	The start date of PI 1 is 02 May 2022 which is same as the start date of the grouped project.
15	Be eligible for crediting from the start date of the project activity instance through to the end of the project crediting period (only).	New PI within this grouped project shall only be eligible for crediting from its start date through to the end of the project crediting period	PI1 will be eligible for crediting from its operating start date, which is 02 May 2022 through to the end of the project crediting period.
16	Only eligible for crediting from the start of the verification period in which they were added to the grouped project.	New PI within this grouped project shall only be eligible for crediting from the start of the verification period in which they were added to the grouped project.	All of instances under the grouped project shall only be eligible for crediting from the start of the verification period in which they were added to the grouped project. This will be confirm to DOE during verification.
17	Not be or have been enrolled in another VCS project.	All of new PIs within this grouped project will be a new activity and not be or have been enrolled in another VCS project.	The project activity 1 will distribute water purifier in Takeo province. It is a new activity and do not leave one VCS project and subsequently enroll another VCS project. This is confirm in section 1.15
18	Where inclusion of a new project activity instance necessitates the addition of a new project proponent to the project, such instances shall be included in the grouped project description within two years of the project activity instance start date or, where	All of new project activity instance within this grouped project will include the information of the project proponent in the project description if the project has a new project proponent within two years of the project activity instance start date.	The project activity 1 is developed by SIPCO, there is no any other project proponent.

	the project activity is an AFOLU activity, within five years of the project activity instance start date. The procedure for adding new project proponents is set out in the Registration and Issuance Process.		
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1.5 Project Proponent

Organization name	Sustainability Investment Promotion and Development Joint Stock Company (SIPCO)
Contact person	Ms. Nguyen Thi Hong Hanh
Title	Director
Address	6 th Floor, Hop Long Building, No.1, 59 Lang Ha Street, Ba Dinh District, Hanoi, Viet Nam
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Email	info@carbonvietnam.com

1.6 Other Entities Involved in the Project

Not applicable

1.7 Ownership

The ownership of carbon credits is the exclusivity with Sustainability Investment Promotion and Development Joint Stock Company (SIPCO), SIPCO is the coordinating & Managing Entity of the grouped project, the ownership of carbon credits shall be demonstrated through following indicative information:

- SIPCO purchases water purifiers directly from the manufacturer named Viet Charcoal Production Company Limited. The water purifier purchased contract shall be signed between the two parties for each project activity instance in this grouped project. Every contract will be attached with a statement or/and a beneficial agreement between the project owner (SIPCO) and the manufacturer, the statement or/and beneficial agreement is to confirm that all carbon credits right from the purchased water purifiers for the project activity shall be remained to the project owner without affected result with manufacturer.
- The ownership of carbon credits also is demonstrated through a beneficial agreement between the project owner, SIPCO, and the target households where get a free distributed water purifiers as the end user, the beneficial agreement shall confirm that the end user

shall irrevocably transfer all rights to any Carbon Credits that may be generated by the operation of the water purifier to SIPCO, and to take all reasonable steps to affect such transfer; the target households irrevocably waive any rights to Carbon Credit in exchange for the free supply of the water purifier.

Therefore, the ownership of SIPCO achieves via enforceable and irrevocable agreement with the holder of the property (household) and contractual right in equipment (water purifier) with the manufacturers that generates GHG emission reductions and/or removals which vests project ownership in the project proponent as per item 5 of section 3.7.1 of the VCS Standard v4.5.

1.8 Project Start Date

The starting date is on 02 May 2022.

As per section 3.9 of the VCS Standard (v4.5), the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals.

The project activity is a non-AFOLU project and first SDWP under the project has been operating from 02 May 2022. Thus, the project start date is as 02 May 2022.

1.9 Project Crediting Period

Fixed crediting period has been chosen.

Start date of crediting period : 02 May 2022

End date of crediting period : 01 May 2032

Total number of years : 10 years, 00 month.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

- ☐ <20,000 tCO₂e/year
- ☒ 20,000 – 100,000 tCO₂e/year
- ☐ 100,001 – 1,000,000 tCO₂e/year
- ☐ >1,000,000 tCO₂e/year

The estimated volume of emission reduction from the project activity instance 1 is 43,129 tCO₂e/year which is less than 300,000 tonnes of CO₂e per year. Therefore, in accordance with the para 3.10.1 of the VCS Standard, v4.5 the scale of the project activity is under “Project” category.

Project Scale	
Project	x
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
02-May-2022 to 31-Dec-2022	28,831
01-Jan-2023 to 31-Dec-2023	43,129
01-Jan-2024 to 31-Dec-2024	43,129
01-Jan-2025 to 31-Dec-2025	43,129
01-Jan-2026 to 31-Dec-2026	43,129
01-Jan-2027 to 31-Dec-2027	43,129
01-Jan-2028 to 31-Dec-2028	43,129
01-Jan-2029 to 31-Dec-2029	43,129
01-Jan-2030 to 31-Dec-2030	43,129
01-Jan-2031 to 31-Dec-2031	43,129
01-Jan-2032 to 01-May-2032	14,298
Total estimated ERs	431,290
Total number of crediting years	10
Average annual ERs	43,129

1.11 Description of the Project Activity

The purpose of this project is the dissemination of water purifiers in Cambodia. The project activity helps to reduce the wood fuel consumption of traditional stove users by distributing water purifiers to households. By reducing the consumption of wood fuel, it can contribute to improving public health problems. Furthermore, this project activity can contribute to Cambodia's climate change respond and sustainable development.

To reduce deforestation and the emission of greenhouse gas in Cambodia, water purifiers that will lead to use no wood fuel, will be distributed to the household which is also using the traditional and/or conventional cookstoves to boil water with wood fuel. Over the long-term, this

project activity is anticipated to reduce deforestation and the emission of greenhouse gas caused by using the burning of wood fuel.

In line with the applied CDM methodology AMS – III.AV, version 08.0 it is assumed that in the absence of the project, the baseline scenario would be the use of woodfuel for boiling water. Therefore, by reducing the total amount of fuel required for boiling water, the water purifiers help reduce the amount of GHG emitted into the atmosphere. Emission Reductions are calculated following the methodology on the basis of the mass of non-renewable woody biomass saved by the water purifiers.

To achieve the initial targeted volume of emission reductions, the project proponent aims to disseminate 26,000 SDWPs in Takeo Province in the project activity instance 1.

Technology

According to the methodology AMS-III.AV (version 08.0), the proposed water purifier implemented by the grouped project is complied with either: (i) the Comprehensive Protection performance target as per “Evaluating household water treatment options: Health-based targets and microbiological performance specifications” (WHO, 2011) and “International Scheme to Evaluate Household Water Treatment Technologies” (WHO, 2014); or (ii) an applicable national standard or guideline. Also, all installed water purifiers do not emit greenhouse gases.

The technology employed in a specific location, water purifiers will be installed into surveyed and selected areas where there is no public distribution network supplying SDWP and no alternative SDWP supply facilities. In case a public distribution network exists, but is not supplying SDWP, water quality testing will be conducted to demonstrate that the water supplied from the public water network does not meet SDWP standards. The information such as the operational principle, instruction and maintenance management method of the water purifier will be transferred to beneficiaries.

The ceramic water filter is designed to improve drinking water quality, help to reduce and prevent intestinal disease. The filtered water is used for drinking directly without having to boil. The use of the water purifier is very simple, they can get clean and safe drinking water in a much easier way than before. The ability to store water safely for a long time without being re-contaminated thanks to the continuous release of silver ions (Ag^+). The filter is capable of deodorizing chlorine and retains essential mineral components $\text{Ca}^{2+}/\text{Mg}^{2+}$.

A specification for project sample device is as follows:

Weight	6 – 6.5 kg	
Tank Capacity	23 liters	
Ceramic filter capacity	7 liters	
Removal of bacteria	99.999%	
Lifespan	10 years	
Material	Plastic, Ceramic Filter, Nano Silver, Activated Carbon	
Dimension	330mm x 330mm x 330mm	
Filter flowrate	2 – 3 l/h	

The ceramic core will be replaced prior to the lifespan, so that end users can access the same or improved level of water purification systems.

The project promotes energy efficient which directly reduces fuelwood consumption, which are non-renewable biomass having higher emission factor. As an associated benefit, the project directly helps reducing the rate of deforestation in the host country.

1.12 Project Location

The grouped project will be hosted by Kingdom of Cambodia. The geographical coordinates of Cambodia are:

- Longitude: from 102.29 E to 107.83 E
- Latitude: from 10.41 N to 14.80 N

The project activity 1 will distribute water purifiers to households in Takeo Province in Cambodia, is scattered throughout the province between: Latitudes: 10.99 N; Longitudes: 104.78 E.

The details of coordinated are being submitted separately in KML file.



Figure 1: Map of Cambodia and Takeo province

Cambodia is divided into 25 provinces. To facilitate the management, implementation, monitoring and sampling stages of the project, the project proponent divides the project boundary into 4 zones.

No.	Zones	Provinces
1	North-Western	Banteay Meanchey, Oddar Meanchey, Preah Vihear, Siem Reap
2	Eastern	Kratie, Mondulhiri, Ratanakiri, Stung Treng
3	Mekong Lowlands	Kampong Cham, Kampong Chhnang, Kampong Thom, Kandal, Prey Veng, Svay Rieng, Phnom Penh, Takeo and Tboung Khmum
4	Cardomom and Elephant Mountains	Battambang, Koh Kong, Pursat, Kampong Speu, Kampot, Kep, Pailin and Preah Sihanouk

1.13 Conditions Prior to Project Initiation

As per the methodology AMS-III.AV (version 08.0) for a simplified and standardized approach it is assumed that fossil fuel or non-renewable biomass (NRB) is used to boil water as means of water purification in the absence of the project activity. The emissions are calculated based on the energy demand for boiling water, and in case of displacement of NRB, the baseline emissions are corrected for the fraction of the biomass that can be demonstrated to be non-renewable. Only purified water consumed for drinking purposes can be used in the baseline calculation.

In Cambodia, 27.76% the population using at least basic drinking water by 2020². Surface water in Cambodia is often plentiful but generally of poor quality, due in part to inadequate or nonexistent sanitation in rural areas³. This leads to diarrhea and other water-borne diseases. And the most common way of treating drinking water for safer use is boiling. Based on a document of World Bank, over 90 percent of energy used for cooking comes from wood, contributing to increased deforestation⁴. The use of wood for burning directly leads to increase greenhouse gas emissions. Furthermore, it can affect to user's health.

The project follows AMS-III.AV: "Low greenhouse gas-emitting safe drinking water production systems", version 08.0. As this is a small-scale methodology, each the instance under the grouped project will achieve emission reductions below 60,000 tCO₂e per annum. Low greenhouse gas emitting water purification systems reduce non-renewable biomass use, relative to the baseline scenario, thereby achieving emission reductions.

Sample surveys or reference literature will be used to determine the type of stoves and fuel used to boil drinking water. The weighted average by total fuel consumption shall be used if more than one type of stove/fuel is used in the project area.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activities under the grouped project are voluntarily coordinated action Sustainability Investment Promotion and Development Joint Stock Company. There is no mandatory law or requirement in Cambodia to foster the dissemination of water purifiers. There are no national laws or regulations in Cambodia that would restrict the implementation of any of these alternative project activities. Therefore, all alternative scenarios considered are in compliance with mandatory regulations.

There are two central policies and regulation in Cambodia. Drinking Water Standard Enacted in 2004 by the Council of Ministers⁵, defining the standards of safe drinking water in line with the WHO guidance, and the National Policy on Water Supply and Sanitation⁶ enacted on 7 February 2003. The National Policy is intended to promote the people's quality of daily living and welfare. Sufficient water supply and sanitation services with low costs as well as using a sustainable, and environmentally friendly sanitation system, are clearly identified as barriers to these objectives national wide.

² <https://data.worldbank.org/indicator/SH.H2O.SMDW.ZS?locations=LA-KH>

³ <https://documents1.worldbank.org/curated/en/211941468216599631/pdf/410240KH0ceramic0filters01PUBLIC1.pdf>

⁴ <https://documents1.worldbank.org/curated/en/570931468036882999/pdf/696390ESW0P1010ECHNOLOGIES0Cambodia.pdf>

⁵ WEPA (Water Environment Partnership in Asia) (2004) *Drinking Water Standard*. [Online] Available from: <http://www.wepadb.net/policies/law/cambodia/07.htm>

⁶ WEPA (Water Environment Partnership in Asia) (2003) *National Policy on Water Supply and Sanitation*. [Online] Available from: <http://www.wepa-db.net/policies/law/cambodia/05.htm>

The National Policy on Water Supply and Sanitation is composed of three main sections:

1. Clean water supply policy for provinces, cities and town.
2. Sanitation policy for provinces, cities and town areas.
3. Clean water supply and sanitation in rural areas.

1. Clean water supply policy for provinces, cities, and town: aims at finding out an appropriate solution within the water supply development in order to ensure the sustainability of service as well as to provide opportunities for poor people. This section has six chapters namely: (i) methodologies of clean water supply; (ii) private sector participation; (iii) price of water consumption; (iv) protection and support for the poor people; (v) autonomy of public services; and (vi) clean water regulators.

2. Sanitation policy for provinces, cities and town areas: aims at ensuring the effectiveness and sustainability of investment, processing of sanitation system, especially, installed facilities. The section has six chapters namely: (i) investing achievement; (ii) technological selection; (iii) finance and budget collection; (iv) sanitation system management; (v) services and private participation; and (vi) service expanding to poverty people.

3. Clean water supply and sanitation in rural areas: has objectives to (a) facilitate the implementation of this policy for all stakeholders; (b) identify the development priority within water supply and rural sanitation as well as long-term sustainability; (c) create the most appropriate methodology to support the programme/initiative aiming for clean water supply and rural sanitation; and (d) deliver the services to people. This section is also composed of six chapters: (i) view point of clean water supply and rural sanitation; (ii) duties and responsibilities; (iii) planning; (iv) standards; (v) private participation; and (vi) control and evaluation

The project complies with all government regulation, specifically concerning the supply of clean water in rural areas and urban areas whilst providing “opportunities for poor people” who can access the technology, both physically and financially. The Cambodian Ministry of Health has been involved, consulted since the very start of SDWP in Cambodia.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The grouped project has not been registered, and is not seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The grouped project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

No. The project will not generate any other form of GHG-related environmental credit for GHG emission reductions claimed under the VCS program. The serial ID number of each water purifier distributed under the project is recorded, and each unique serial ID is assigned to a single user whose details are recorded at the time of water purifier purchase. A searchable database containing these details enables cross checking.

The project activity under VCS shall not claim emission reductions for the same period that has been/will be covered under other GHG Programs. Thus, there will not be any possibility of double accounting of emission.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

Not applicable.

Supply Chain (Scope 3) Emissions

Have the owner(s) or retailer(s) of the impacted goods and services⁷ posted a public statement saying, “VCUs may be issued for the greenhouse gas emission reductions and removals associated with Ecozen-25 water purifiers, manufactured by Viet Charcoal Production Company Limited’s in Di Su commune, My Hao district, Hung Yen Province, Viet Nam, distributed by Sustainability Investment Promotion and Development Joint Stock Company (SIPCO) under their project activity title “Grouped Project for Cambodia Water Purifier” (VCS ID: 3052) since the project’s start date?

☐ Yes ☒ No

Viet Charcoal Production Company Limited is in charge of manufacturing water purifiers for SIPCO's greenhouse gas emission reduction projects. The company received an email from SIPCO requesting a public statement for scope 3 emission of the project. However, Viet Charcoal's

⁷ Impacted goods and services are all goods and services directly impacted by the technologies and measures specified as project activities in the project description. Please see the VCS Program document *VCS Program Definitions* for additional information.

website is only used to introduce their products to partners, and does not publish information on their partners' projects to avoid misunderstanding. Therefore, all public statements for supply chain of scope 3 emission will be announced directly by the project proponents on their websites instead.

Has the project proponent posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with Ecozen-25 water purifiers, manufactured by Viet Charcoal Production Company Limited's in Di Su commune, My Hao district, Hung Yen Province, Viet Nam, distributed by Sustainability Investment Promotion and Development Joint Stock Company (SIPCO) under their project activity title "Grouped Project for Cambodia Water Purifier" (VCS ID: 3052)"

☒ Yes

☐ No

SIPCO has posted a public statement on their website.

Have the producer(s) or retailer(s) of the impacted good or service been notified of the project and the potential risk of Scope 3 emissions double claiming via email?

☒ Yes

☐ No

SIPCO has sent the notification of the project and the potential risk of Scope 3 emission double claiming to Viet Charcoal Production Company Limited via email.

1.17 Sustainable Development Contributions

The project activity helps in achieving following co-benefits, which will contribute in sustainable development in host country.

1. Environmental sustainability:

- The project will help significantly reduce greenhouse gas emissions over its lifetime.
- The project will help reduce the use of non-renewable biomass from forests, assisting the maintenance of existing forest stock, protecting natural forest eco-systems and wildlife habitats.
- The protection of standing forests will ensure the maintenance of watersheds that regulate water table levels and prevent flash flooding.

2. Social benefits

- Purchasing or collecting firewood to boil the water constitutes a significant expense for the very poorest households and communities. The project will provide access to clean drinking water, which will reduce the cost for families and thereby improve attendance at households, increase productivity, and more generally give a sense of hope and opportunity.

- Micro-entrepreneurs: low greenhouse gas emitting water purification technologies offer scope for micro-entrepreneurs (Distributors/Installers), thereby creating jobs and supporting families.
- There is a direct incentive to ensure that the projects (instance) have a successful long-term operation as this will ensure continued SDWP.
- Polluted indoor air due to open and uncontrolled combustion is a huge health concern. Low greenhouse gas emitting water disinfection technologies tackle this problem by reducing the combustion of wood fuel.
- The project will alleviate the work burden of women and children as they have to spend less time to collect firewood for boiling water.

3. Economic benefits

- The project activity will help develop a section of Cambodia rural economy through the installation and maintenance of SDWPs, as well as work related to monitoring of the carbon registration activity.
- The proposed project will deliver a long term, secure and simple contribution to sustainable development in Cambodia that would not exist without carbon finance.

1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable, as project activity has been designed to include only new water purifiers. No used water purifiers will be transferred or deployed from outside the geographical project boundary to the project activity.

Where relevant leakage relating to the non-renewable woody biomass shall be assessed as per the relevant procedures of AMS-I.E (Switch from non-renewable biomass for thermal applications by the user) (version 13.0). In accordance with that methodology, option (a), BE_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. If the equipment currently being utilized is transferred from outside from the boundary to the project boundary, leakage is to be considered.

Commercially Sensitive Information

Not applicable.

Further Information

Not applicable.

2 SAFEGUARDS

2.1 No Net Harm

Greenhouse gas reductions: Project implementation will result in GHG reductions because it will reduce the consumption of non-renewable biomass in countries where the biomass harvested for fuel use is typically non-renewable.

Air quality: Users (especially women and children) will be exposed to fewer air pollutants through reduced emission of not only CO₂, but also carbon monoxide and particulate matter.

Air pollution from cooking with solid fuel is a key risk factor for childhood pneumonia as well as many other respiratory, cardiovascular and ocular diseases.

Biodiversity: will be improved as the grouped project reduces pressure on remaining forest reserves in Cambodia. No negative impacts can be identified.

2.2 Local Stakeholder Consultation

Procedure followed to invite stakeholder comments

The local stakeholder consultation consisted of a public meeting with the stakeholders. Stakeholders were identified as relevant NGOs, water purifier manufacturing company, local authorities and representatives from households that directly or indirectly impact on the project activities and were invited by post mail.

Program of the public

Date of meeting: 2nd May, 2022

Place: at meeting room in Takeo provincial administration, Takeo People's Committee.

Language: English and Khmer

Meeting procedure:

- Introduction: Stakeholders, Project Developers
- Context and objectives of public consultation
- Presentation of Project
- Water purifier
- Video Spot Projection
- Modalities of distribution and use
- Environment and socio-economic Impacts

- Questions and answers with participants
- Conclusion/ Cocktail

Stakeholder Comments

After listening Mr. Hoang Anh Dung, a chairman of SIPCO made presentation on the project activity and the social, economic and environmental impacts to communities, Stakeholders have clearly understood the operation one. The grouped project of free distribution of water purifiers to households who do not access safe drinking water so all stakeholder welcome. The project activities will bring many benefits to households, especially in remote areas, difficult areas.

All stakeholders supported the project activities without negative comments.

At the end of the meeting, the contact details of SIPCO have been shared with the participants to ensure on-going communication with the stakeholders.

Mechanism for on-going communication

SIPCO through Cambodian Women for Peace and Development (CWPD) to jointly distribute water purifiers to households. The CWPD network from district to commune to village level which will receive any comments from end-users in using water purifiers. After that, CWPD will immediately report to SIPCO.

Following details have been communicated to participants:

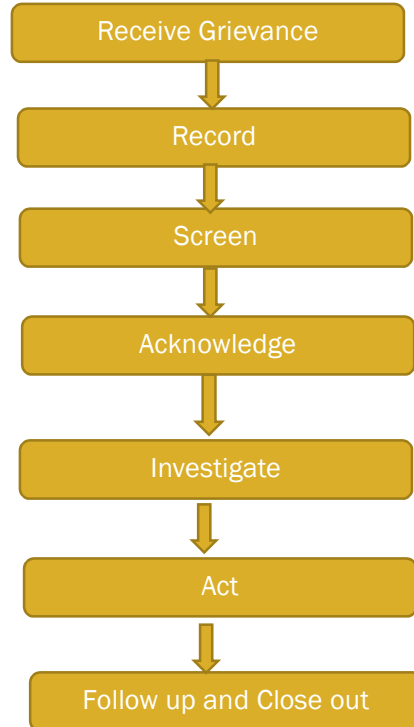
- Via email: info@carbonvietnam.com

SIPCO will continue to implement these informal on-going consultation procedures, alongside formalized consultation through annual our survey.

Grievance mechanism

Project proponent has established a grievance mechanism in the project area which has been explained to the stakeholders during stakeholder meetings and the project implementation progress. The stakeholders affected by the project can express any complaint. Any grievances could send to SIPCO email address. Also stakeholders can voice their grievances to any officers who will then escalate using the correct process. For online form, stakeholders can complete a grievance form located on SIPCO website: www.carbonvietnam.com

The grievance mechanism process could be illustrated as below:



- Receive Grievance

The grievance could be received by all means, such as in person/over the phone, via email/website,

- Record

All formal grievances will be logged in the External Grievance Register and Grievance Lodgment Forms will be saved for record of correspondence.

- Screen

The stakeholder contact officer is responsible for assigning a grievance owner to liaise with the external stakeholders and work on a resolution. Grievances will be screened depending the level of severity in order to determine who the grievance owner will be and how the grievance is approached.

- Acknowledge

A grievance will be acknowledged, by the grievance owner, within two working days of a grievance being submitted. Communication will be made either verbally or in written form.

The acknowledgement of a grievance should include a summary of the grievance, method that will be taken to resolve the grievance and an estimated timeframe in which the grievance will be resolved. If required, the acknowledgement provides an opportunity to ask for any additional information or to clarify any issues.

- Investigate

The grievance owner is responsible for investigating the grievance. The investigation may require the grievance owner to make site visits, consult employees, contact external stakeholders and complete other activities. Records of meetings, discussions and activities all need to be recorded during the investigation. Information gathered during the investigation will be analysed and will assist in determining how the grievance is handled and what steps need to be taken in order to resolve the grievance.

- Act

Following the investigation, the grievance owner will use the findings to create an action plan outlining steps to be taken in order to resolve the grievance. The grievance owner is responsible for assigning actions, monitoring actions undertaken and making sure deadlines are adhered to. Once all actions have been completed and the grievance owner feels the grievance has been resolved, they will then formally advise the external stakeholder via their preferred method of contact.

- Follow up and close out

The grievance owner will make contact with the external stakeholder/s three weeks after the grievance is resolved. When contacting the external stakeholder, the grievance owner will verify that the outcome was satisfied and also gather any feedback on the grievance process.

Minutes of the meeting will be recorded and saved.

If required the grievance owner may need to follow up with the external stakeholder on numerous occasions to confirm all parties are satisfied.

2.3 Environmental Impact

The implementation of the grouped project does not impose any severe impacts on the ecological system in the surrounding areas. This project activity will help in reducing the consumption of fuel wood and reducing indoor air pollution. The use of water purifier technology will reduce adverse environmental and social impacts associated with the use of non-renewable biomass. The reduced consumption of the stated baseline fuel will have sustainable benefit for all target households where use traditional cookstove to boil drinking water included in the project activity. The implementation of the project will reduce workloads involved in fuel collection, and by reducing indoor air pollution, will reduce the risk of respiratory diseases, especially for women and children. Efficient or water purifiers will also contribute to environment protection by reducing biomass consumption and hence greenhouse gas emissions, mainly CO₂, when the combusted biomass originates from non-renewable stocks. Hence, no negative environmental impacts have been identified from the project and environmental impact assessment (EIA) is not required for the project.

2.4 Public Comments

30-day public comments of the grouped project were from 10 Jul 2022 to 09 Aug 2022. PP did not receive any comments during this period.

2.5 AFOLU-Specific Safeguards

The grouped project is a non-AFOLU projects activity, hence not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

AMS – III.A.V: “Low greenhouse gas emitting safe drinking water production systems”, version 08.0.

This grouped project also refers to the approved versions of the following tools, methodology and methodologies:

- Tool 30 – “Calculation of the fraction of non-renewable biomass”; version 04.0
- TOOL01 “Tool for the demonstration and assessment of additionality”, version 07.0
- AMS-I.E: “Switch from non-renewable biomass for thermal applications by the user”, version 13.0.
- “Standard for Sampling and Surveys for CDM Project. Activities and Programme of Activities” – version 09.0
- “Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities” – version 04.0

3.2 Applicability of Methodology

Table 3.1: Applicability of Methodology

No	CDM Methodology Requirement	Justification
1	This methodology comprises introduction of low greenhouse gas emitting water purification systems to provide safe drinking water (SDWP). Water purification technologies that involve point-of use (POU) or point-of-entry (POE) treatment systems for residential or institutional applications such as systems installed at a households or a community Centre are included. The examples include, but are not limited to, water filters (e.g. membrane, activated carbon, ceramic filters), solar energy powered ultraviolet (UV) disinfection devices, solar disinfection techniques, photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (eg. chlorination), combined treatment approaches (eg. Flocculation plus disinfection). The methodology is also applicable to water kiosks that treat water using one or more of the following disinfection. In case the water kiosks using solar disinfection powders and solar implement measures to prevent recontamination (e.g. disinfecting containers, sealing containers and hygiene trainings).	Under this grouped project, low greenhouse gas emitting water purification will be distributed to households. Detail of technology has been detailed in section 1.11 of this grouped VCS.
2	Soil filtration schemes (boreholes, wells) that include container disinfection (e.g. chlorination) may be applied. Project proponents shall demonstrate ex ante that rehabilitation and/or construction of the wells complies with relevant national and/or international standards and that measures are taken to ensure that water and well are not contaminated.	This is not applicable for this proposed project.
3	Prior to the implementation of the project activity, a public distribution network supplying SDWP) to the project boundary does not exist.	For each project activity instance shall proof that a public distribution network supplying SDWP does not exist in the project boundary. If during the crediting period SDWP is made available through a public distribution network, the emission reductions pertaining to the households, supplied by the public system area cannot be claimed from that point onwards. This condition will be checked annually during the crediting period.

4	It shall be demonstrated based on laboratory testing or official notifications (for example notifications from the national authority on health) that the application of the project technology/equipment achieves compliance either with: (i) the “interim” performance target as per “Evaluating household water treatment options: Health based targets and microbiological performance specifications” (WHO, 2011); and “International Scheme to Evaluate Household Water Treatment Technologies” (WHO, 2014) or (ii) an applicable national standard or guideline. Applicable national standard should be based on laboratory efficacy testing that, at a minimum, includes quantitative microbial measures of pre- and post-treatment challenge waters that are representative of potential drinking water sources, and that includes measured reductions based on at least one pathogen class (bacteria, viruses, protozoa).	The drinking water purifier supply use various water treatment filters according to the water quality of water sources to meet the national standard or guideline of Cambodia. The outlet quality water shall meet microbes defined in Drinking Water Quality Standards.
5	In cases where the life span of the water treatment technologies is shorter than the crediting period of the project activity, there shall be documented measures in place to ensure that end users have access to replacement purification systems of comparable quality.	The lifespan of the water purifier is 10 years, which is the length of the crediting period of the instance
6	It should be demonstrated that the project appliances use technologies that meet the technology standards as per paragraph 4(b) of approved methodology AMS-III.AV version 08.0, and that they deliver microbiologically safe drinking water.	Each water purifier shall confirm to the technology standards as per paragraph 4(b) of approved methodology AMS-III.AV version 08.0. The outlet quality water shall meet microbes defined in Drinking Water Quality Standards for drinking waters.
7	The use of this methodology in a project of activity under the grouped projects is legitimate if the leakage is estimated and accounted for as per the relevant provisions of AMS-I.E version 13.0 under the section for the grouped projects.	Leakage is calculated by applying a net to gross adjustment factor of 0.95 to account for leakages.

Table 3.2: Applicability off applied Tools

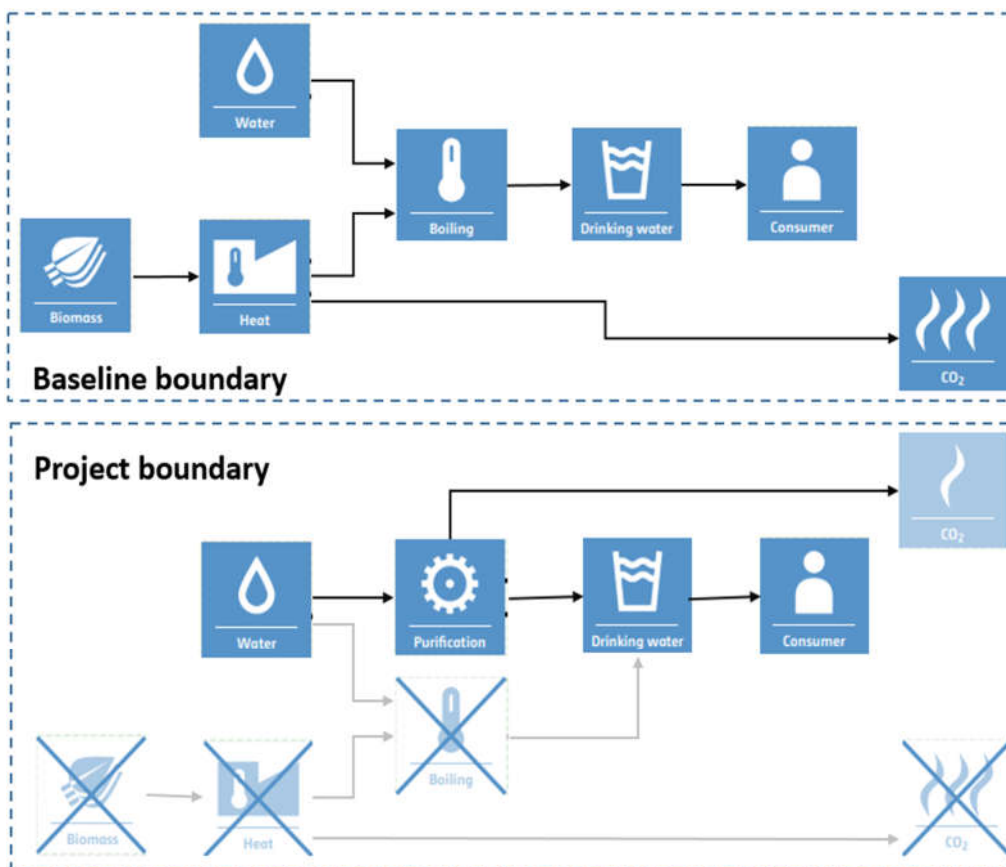
Tool	Applicability	The project
TOOL01 “Tool for the demonstration and assessment of additionality”.	The use of the “Tool for the demonstration and assessment of additionality” is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool.	Complies. Simple cost analysis in Tool 01 is applied to demonstrate and assessment of additionality for each instance of grouped project.
	Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory	Complies. The additionally tool is not included in approved methodology. However, the project participants using simple cost analysis in tool 01 to demonstrate and assessment of additionality.
TOOL 30: Calculation of the fraction of nonrenewable biomass	This tool may be used by: (a) DNAs to submit region/country-specific default fNRB values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or (b) (b) Project proponents to calculate project or PoA-specific fNRB values.	Complies. This tool was used by the project participants to calculate a project specific value for fNRB under option (b) of applicability condition 1.
	For project or PoA specific fNRB values, project proponents shall assess the area where biomass is sourced and justify the selection of the area in CDM project design documents.	Complies. The area for the calculated value was selected to coincide with the Grouped Project’s project boundary
AMS-I.E.: “Switch from non-renewable biomass for thermal	The use of this methodology in a project of activity under a grouped project is legitimate if the leakage is estimated and accounted for as per	Complies. Leakage is calculated by applying a net to gross adjustment factor of 0.95 to account for leakages.

applications by the user”	the relevant provisions of AMS-I. E under the section for grouped project.	
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3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Non-renewable biomass to boil drinking water	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	No	Minor emission source
Project	Non-renewable biomass to boil drinking water	CO ₂	Yes	Minor emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	No	Minor emission source

A representation of the baseline boundary and project boundary are given as below:



3.4 Baseline Scenario

As per the methodology AMS-III.AV (Version 08.0) for a simplified and standardized approach it is assumed that woodfuel is used to boil water as mean of water purification in the absence of the project activity. The emissions are calculated based on the energy demand for boiling water, and in case of displacement of woodfuel, the baseline emissions are corrected for the fraction of the biomass that can be demonstrated to be non-renewable. Only purified water consumed for drinking purposes can be used in the baseline calculation.

In Cambodia, 27.76% the population using at least basic drinking water by 2020⁸. Surface water in Cambodia is often plentiful but generally of poor quality, due in part to inadequate or non-existent sanitation in rural areas⁹. This leads to diarrhoea and other water-borne diseases. And the most common way of treating drinking water for safer use is boiling. Based on a document of World Bank, over 90 percent of energy used for cooking comes from wood, contributing to increased deforestation¹⁰. The use of wood for burning directly leads to increase greenhouse gas emissions. Furthermore, it can affect to user's health.

The project follows AMS-III.AV: "Low greenhouse gas-emitting safe drinking water production systems", Version 08.0. As this is a small-scale methodology, each instance under the project will achieve emission reductions below 60,000 tCO₂e per annum. Low greenhouse gas emitting water purification systems reduce fossil fuel and non-renewable biomass use, relative to the baseline scenario, thereby achieving emission reductions.

A baseline survey was conducted before distributing water purifiers by SIPCO and Cambodia Women for Development and Peace (CWPD) for Takeo province, where project activity instance 1 will take place to confirm the type of baseline cookstove to boil water, the household size, the public water supply system, average amount of drinking water, the fuel used to boil water. From the list of 50,772 households selected by the CWPD, the PP calculates the sample size based on Guidelines for sampling and surveys for CDM project activities and programs of activities, v.04.0 and Standard Sampling and surveys for CDM project activities and programs of activities, v.09.0 by establishing a 10% of error and confidence level up to 95% to determine the baseline parameters.... The result of sample size is 372, In order to avoid cases of samples being transmitted but no results are obtained, we will investigate an additional 20% of the sample size of 465 samples. Applying the simple random sampling technical, the household numbers are randomly chosen from the required sample size as calculated by the PPs. To ensure the survey result is representative of the entire population, the dissimilarity (such as village, individuals...) chosen randomly such that each element (or unit) of the population has the same probability of

⁸ <https://data.worldbank.org/indicator/SH.H2O.SMDW.ZS?locations=LA-KH>

⁹ <https://documents1.worldbank.org/curated/en/211941468216599631/pdf/410240KH0ceramic0filters01PUBLIC1.pdf>

¹⁰ <https://documents1.worldbank.org/curated/en/570931468036882999/pdf/696390ESW0P1010ECHNOLOGIES0Cambodia.pdf>

being selected. The survey method has been use is face to face interview by questionnaires. The result of the baseline survey shows that 98.48% households use woodfuel to boil drinking water.

3.5 Additionality

The additionality of the grouped project is demonstrated by using TOOL01 “Tool for the demonstration and assessment of additionality” version 07.0. These steps include:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulation

Sub-step 1a: Define alternatives to the project activity:

- (1) The project activity distributes water purifiers to target households without the support of revenues from the sale of GHG credit.
- (2) Target households use electricity or gas to boil drinking water. However, this water treatment method requires additional monthly costs. Target households of the grouped project are poor and near-poor households who do not have access to safe drinking water and have very low incomes. Hence, this alternative scenario is not suitable.

Therefore, to demonstrate the project’s additionality, PP use alternative scenario No.1 as above.

Sub-step 1b: Consistency with mandatory laws and regulations:

There is no mandatory law or requirement in Cambodia for the installation of water purification technologies/measures (SDWPs).

Step 2: Investment Analysis:

The grouped project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than GHG related income. Therefore, the instances of the grouped project shall demonstrate additionality by Simple cost analysis, by demonstrating the eligibility criteria that installation of SDWPs are free of cost to users.

Sub-step 2b: Option I. Apply simple cost analysis

For project activity 01 would be distributed 26,000 water purifiers free of cost to target households, there is no financial return to project other revenue the sale of GHG credits. PP buys a water purifier for 420,000 VND¹¹. Moreover, there are costs associated with the transport and

¹¹ Based on the purchase equipment between SIPCO and water purifier manufactures.

distribution of the SDWPs are 1,253,200,000 VND¹² and 313,300,000 VND¹³, respectively. Estimated project cost is 12,486,500,000 VND. This project activity 1 will not occur in absence of the GHG credits revenue. The action is not financially viable without the support of revenues from the sale of GHG credit.

The proposed project activity is more costly than alternative so proceed to Step 4

Step 4: Common practice analysis

In the region, no similar project provides free water filters at scale without carbon credits. Hence, this is not common practice in Cambodia.

In above, it can be demonstrated this project meets additionality.

3.6 Methodology Deviations

Not applicable

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The baseline emissions shall be calculated as follows:

$$BE_y = QPW_y \times m \times X_{boil} \times SEC \times \sum_i (BL_{fuel,i} \times f_i \times EF_{projected\ fossil\ fuel,i} \times 10^{-9})$$

Where:

BE_y	: Baseline emissions during the year y in (tCO ₂ e)
QPW_y	: Total quantity of purified water by the project in year y (litres)
m	: Fraction of functional appliances that are meeting the SDWP standards (%). Only project appliances that (i) use technologies that meet the technology standards as per paragraph 4(b) and (ii) are operating or replaced by an equivalent in service appliance and (iii) deliver microbiologically safe drinking water, are counted for emission reductions.
X_{boil}	: Fraction of the population served by the project activity for which the common practice of water purification is or would have been water boiling. This shall be

¹² Based on the transportation contract between SIPCO and transportation partner

¹³ Based on the distribution contract between SIPCO and CWPD

determined ex-ante through surveys.

- SEC : Specific energy consumption required to boil one litre of water(kJ/L) to be calculated according to paragraphs below.
- $BL_{fuel,i}$: Proportions of baseline fuel type i (NRB and/or fossil fuels)used in the absence of the project activity (fraction).
- f_i : Fraction of non-renewable fuel type i used in the absence of the project activity in year y. For biomass it is the fraction of woody biomass that can be established as non-renewable biomass (f_{NRB}). If the baseline fossil fuel, the value to be applied is 1.
- $EF_{projectedfossilfuel,i}$: Emission factor of the fossil fuel substituted (tCO₂/TJ).

4.1.1. Determination of the quantity of purified water serviced by the project activity in year y

The quantity of purified water is the total of water treated by the project activity in year y

As per paragraph 16 of the applied methodology AMS-III.AV (version 08.0), the quantity of purified water in a year should be monitored and calculated based on the following options:

$$QPW_y = P_y \times \min (QPW_{pp}; 5.5) \times 365$$

Where:

- P_y : Population who consumes the purified water serviced by the project activity in year y
- QPW_{pp} : Average volume of drinking water per person per day L/person/day determined ex ante of the crediting period through a baseline survey

The number of water purifiers which are distributed in project activity instance 1 under this grouped project activity is 26,000 units to 26,000 households in Takeo province in Cambodia.

The average number of person in household in Cambodia is 4.6 person/household¹⁴.

So the population who consumes the purified water service by the project activity 1 in year is 26,000 x 4.6 = 119,600 persons.

As baseline survey, the total of daily drinking water usage by 465 households is 11,016 litre/day. Therefore, the average volume of drinking water per person per day is (11,016/465)/4.6 = 5.15 l/person/day which is less than the maximum quality of drinking water person per day of 5.5l/person/day defined in AMS-III.AV v.8.0.

So, the quantity of purified water in year is

$$QPW_y = P_y \times \min (QPW_{pp}; 5.5) \times 365 = 119,600 \times 5.15 \times 365 = 224,818,100 \text{ l/year}$$

¹⁴ Page 7 in https://nis.gov.kh/nis/Census2019/Provisional%20Population%20Census%202019_English_FINAL.pdf

4.1.2. Determination of the fraction of fuel type (Non-renewable biomass)

This parameter has made and calculated by the Third Party Organization (I,e C4 Ecosolutions (Pyt) Ltd. The report and calculation sheet were submitted to DOE during validation period. For biomass, the fraction is 0. 7044 for the host country Cambodia, which is determined at the instance level as per TOOL30 “Calculation of the fraction of non – renewable biomass”, version 4.0, the following equation is used:

$$f_{NRB} = \frac{NRB}{NRB + RB}$$

Where:

f_{NRB}	Fraction of non-renewable biomass in the applicable area in the relevant period (fraction or %)
NRB	Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)
RB	Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)

The quantity of non-renewable biomass (NRB) s the difference between the annual biomass consumption (H) and the quantity of renewable biomass (RB), calculated by the following equation:

$$NRB = H - RB$$

Where:

H: Total woody biomass consumption in the absence of project activity (t/yr)

- **Estimating total woody biomass consumption in Cambodia**

The reported volumes of fuelwood consumed in cubic meters (m³) are converted to metric tonne (t) using the FAO default wood density factor of 0.725 metric tonne per cubic meter (t/m³). The reported mass of charcoal consumption is converted to the equivalent woody biomass using the latest CDM Tool 30 v4.0 2022 default charcoal-to-wood biomass conversion factor¹⁰. Finally, consumed volumes of commercial forest products — including industrial roundwood, sawnwood, veneer sheets and wood-based panels — are converted to metric tonne (t) using a biomass conversion and expansion factor (BCEF) (in t/m³) provided for the region. The FAO accounts for non-users by determining the per capita consumption rates in 2019 from dividing the 2019 consumption by the total population in 2019.

Domestic woody biomass consumption (in cubic meter per year (m³/yr)) is estimated by multiplying the 2019 per capita consumption rates (in cubic meter per capita per year (m³/capita/yr) for wood fuel obtained from the UN Statistics Division (see Table 1) with

Cambodia's 2021 total population. Accordingly, the total domestic woody biomass consumption is conservatively estimated to be 5,814,980 metric tonne per year (t/yr) after applying the wood density conversion.

The non-domestic woody biomass consumption is estimated using 2019 per capita consumption rates provided by the UN Statistics Division (see Table 1), disregarding the deforestation likely occurring because of shifting agriculture and informal or illegal harvesting, as available data for these activities are scarce. Non-domestic energy consumption for Cambodia is reported as the quantity fuelwood for transformation in charcoal plants (in m³/capita/yr) and non-domestic non-energy consumption for Cambodia is reported as the quantity of wood for manufacturing, construction and non-fuel industry (in m³/capita/yr). Per capita consumption rates were multiplied by the national 2021 population for each consumption category and the necessary conversions to metric tonne per year (t/yr) completed. Cambodia's non-domestic energy and non-domestic non-energy consumption values are estimated to be 3,252,408 t/yr and 6,554,229 t/yr, respectively. The total woody biomass consumption is the sum of domestic, non-domestic energy and non-domestic nonenergy consumption and is estimated to be 15,621,617 t/yr.

Table 4.1: Total 2021 population, woody biomass consumption, and per capita consumption estimates for Cambodia

Variable	Value	Source
Population		
Total	16,946,446	The World Bank
Domestic woody biomass consumption		
Fuelwood for consumption in households (t/yr)	5,814,980	Calculated
Domestic per capita consumption rates		
Fuelwood (m³/capita/yr)	0.473	UN Data
Total Non-domestic (energy) wood consumption		
Transformation in charcoal plants (m³/yr)	3,252,408	Calculated
Total Non-domestic (non-energy) wood consumption		
Total non-domestic (non-energy) (t/yr)	6 554 229	Calculated
Non-domestic per capita consumption per category		
Transformation in charcoal plants (m³/capita/year)	0.154	UN Data
Manufacturing, construction and non-fuel industry (m³/capita/year)	0.309	
Conversion factors		
Wood density (t/m³)	0.725	FAO
Biomass conversion and expansion factor (t/m³)	1.250	FAO
Total woody biomass consumption (t/yr)	15,621,617	Calculated

- *Estimating renewable biomass, non-renewable biomass and fraction of non-renewable biomass in Cambodia*

Renewable biomass is the product of the mean annual increment of woody biomass growth and the total extent of the forest and other wooded areas of the country where wood extraction is not prohibited or geographically remote, calculated by the following equation:

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest,i})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other,i}))$$

Where:

- MAI: Mean annual increment of woody biomass (t/ha/yr)
- F_{forest}: Extent of forest in the relevant period (ha)
- F_{other}: Extent of other land in the relevant period (ha)
- P_{forest}: Extent of non-accessible area within forest areas (ha)
- P_{other}: Extent of non-accessible area within other land areas (ha) i = Sub-category i of forest areas and other land areas.

Table 4.2. Total, protected and remote tree cover extent, mean annual increment (MAI), and renewable biomass (RB) by Global Ecological Zone for Cambodia.

Ecological Zone	Total tree cover (ha)	Protected cover (ha)	Remote cover (ha)	MAI (t/ha/yr)	Renewable biomass (t/yr)
Tropical dry forest	2,555,072	913,563	1,060,791	1.19	1,772,909
Tropical moist forest	2,135,828	1,261,064	477,383	0.75	1,241,657
Tropical rainforest	1,633,818	1,413,588	102,491	1.05	1,602,668
Total	6,324,718	3,588,215	1,640,665		4,617,234

The difference between total woody consumption (H) (Table 4.1) and renewable biomass (RB) (Table 4.2) is non-renewable biomass (NRB) (Equation 2). The NRB provides an indication of the amount of wood utilization in Cambodia that is considered unsustainable and is estimated to be 11,004,383 t/yr (Table 4.3).

The fraction of non-renewable biomass (fNRB) is the quotient of the non-renewable and the total biomass (Equation 1). The fNRB for Cambodia is, therefore, estimated to be 0.7044 (Table 4.3).

Table 4.3: Summary of the fraction of non-renewable biomass (fNRB) calculation for Cambodia:

Variable	Value	Source
Total woody biomass consumption (t/yr)	15,621,617	Table 4.1
Renewable biomass (t/yr)	4,617,234	Table 4.2
Non-renewable biomass (t/yr)	11,004,383	Calculated
Fraction of non-renewable biomass	0.7044	Calculated

The estimated NRB for Cambodia was compared to the top-down product of average aboveground biomass (69.30 tonnes per hectare (t/ha))¹⁵ and the most recent annual deforestation data (155,690 hectare per year (ha/yr))¹⁶. The NRB, as calculated in this report according to the CDM Tool 30 v4.0 2022, was found to be 11,004,383 t/yr, which is similar to the crosscheck results based on deforestation (10,789,317 t/yr). Consequently, the estimate of NRB is considered applicable for this study given that the guidance provided by CDM Tool 30 v4.0 2022 was followed.

The fraction of non-renewable biomass is the quotient of the non-renewable and the total biomass. The fraction of non-renewable biomass for Cambodia is, therefore, estimated as 0.7044.

The resulting fNRB value is higher than the expected fNRB values determined in peer reviewed literature¹⁷ using the WISDOM method. While direct comparisons between the WISDOM and CDM methodologies are only sometimes appropriate—given the different approaches of the methodologies—the following factors can contribute to variations in the fNRB estimates between the application of the CDM method in the present study and the WISDOM method in the peer reviewed literature¹⁸:

- More recent population statistics (2021) for Cambodia were used and represents an increase in population numbers since the 2009 data utilised in the comparison study.
- Updated 2019 FAO forest products statistics were used in the present study, whereas the comparison study used 2013 FAO forest products statistics.
- The approach used to determine the amount of forest that is accessible yields lower estimates in the present study than the comparison study. This results in a lower estimated RB and consequently increased NRB and fNRB.
- In the present study, MAIs were calculated using a weighted average based on the forest area of three categories (i.e., primary forests, above 20-year secondary forest, below 20-year secondary forest). Data from the 2019 Refinement of the 2006 IPCC Guidelines was used in combination with extrapolating the observed forest gain extents between 2000 and 2012 to a future 21-year period. As per the comparison study, MAI values were derived from a combination of field observations and IPCC values, followed by a different estimation of growth rates as a percentage of standing stock. This approach often yields higher MAIs and may lead to higher estimations of RB and subsequently, lower estimations of NRB and fNRB.

¹⁵ FAO 2020a

¹⁶ Mongabay. 2020. Rainforest information. Available at: <https://rainforests.mongabay.com/>. Accessed on 31 May 2023

¹⁷ Bailis R, Drigo R, Ghilardi A and Masera O. 2015. The carbon footprint of traditional woodfuels. *Nat Clim Chang* 5: 266–272.

¹⁸ Ibid

4.1.3. Determination of the efficiency of the water boiling systems

Efficiency of the water boiling systems being replaced. Use one of the options below:

- (a) The efficiency of the water boiling system shall be established using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of systems is encountered;
- (b) 0.10 default value may be optionally used if the replaced system or the system that would have been used is a three stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system that is without a grate as well as a chimney; for the rest of the systems using woody biomass 0.2 default value may be optionally used;
- (c) 0.5 default value may be used if the replaced system or the system that would have been used is a fossil fuel combusting system.

Among 465 households was surveyed in Takeo province, the result show that the number of boiling by traditional cookstove, other cookstove and both at the time are 432 households, 7 households and 16 households, respectively.

However, the project proponents will only distribute the SDWPs for households who have used the traditional cookstove to boil drinking water. Therefore, the efficiency of the water boiling systems is 0.1.

4.1.4. Determining the specific energy consumption required to boil one litre of water

$$SEC = \frac{[WH \times (T_f - T_i) + 0.01 \times WHE]}{n_{wb}}$$

Where:

WH = 4.186 KJ/LoCT_f = 100°C

T_i = 20°C

WHE = 2,260 KJ/L

n_{wb} = 0.10

SEC = [4.186 *(100-20) + 0.01*2,260]/0.10 = 3,575 (KJ/L)

4.1.5. Determination the fraction of the functional appliances that are meeting the SDW standards (%)

This parameter shall be determined through checking all appliances or a statistically representative sample of the appliances to ensure the following conditions that:

- (a) They only use technologies that are meeting the SDW technology standards as per paragraph 4(b) of methodology AMS III.AV;
- (b) They are still operating or are replaced by an equivalent in-service appliance.

(c) They are delivering microbiologically safe drinking water.

Some statistically representative sample was tested by Lab and Water Quality shall met the Microbiological parameters required by Drinking Water Quality Standards for drinking water. So, the assume value “m” is 1.0. This value will be monitored annually for each monitoring.

4.1.6. Determination the fraction of the population served by the project activity for which the common practice of water purification is or would have been water boiling

PP surveyed random 465 households in Cambodia, the data collected is as follows: 98.48% (458 households) said that they have to boil water before drinking. Therefore, the fraction of the population served by the grouped project activity $X_{boil} = 0.9848$

4.1.7. Determination the proportions of woody fuel type I (NRB and/or fossil fuels) used to boil water in the absence of the project activity

This parameter is determined based on baseline survey. The survey team used the question are to survey the treatment method that households used to boil drinking water. The results show that the major fuel used is wood. Detail is shown by the table below:

Number of households	Kind of fuel			
	Wood	Charcoal	Gas	Electricity
439	x			
4		x		
3				x
6	x	x		
2	x		x	
1	x			x

According to above table, the using fuel ratios of 465 households are randomly surveyed as follows: the greatest share of 95.02% is recorded in wood. The subsequent ranks belong to wood & charcoal. The former occupies 1.30%, the latter accounts for 0.87%. Lastly, 0.65%, 0.43%, 0.22% are the percentages of electricity, wood & gas and wood & electricity, in the other given.

Since the project only distributes water purifier to households, who are using traditional cookstove and wood fuel to boil drinking water. Hence, the proportions of baseline fuel type I used in the absence of the grouped project activity is 95.02%.

4.1.8. Determination Emission factor of the fuel type

The fuel displaced is NRB, 85.7 is used for East Asia and the Pacific sourced from approved methodology AMS-I.E version 13.0

Baseline emissions

The baseline emission can be calculated by the equation.

$$BE_y = QPW_y \times m \times X_{boil} \times SEC \times \sum_i (BL_{fuel,i} \times f_i \times EF_{projected\ fossilfuel,i} \times 10^{-9})$$

$$= 224,818,100 \times 1 \times 0.9848 \times 3,575 \times 0.9502 \times 0.7044 \times 85.7 \times 10^{-9} = 45,399 \text{ tCO}_2/\text{year}$$

4.2 Project Emissions

Refer to section 4.4 for the calculation of emission reductions resulting from the proposed project. There are no project emissions considered).

4.3 Leakage

Where relevant leakage relating to the non-renewable woody biomass shall be assessed as per the relevant procedures of AMS-I.E version 13.0 explained below:

By will be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. This is applied for the grouped project.

$$\text{So } LE_y = BE_y \times (1 - 0.95)$$

$$LE_y = 45,399 \times (1 - 0.95) = 2,270 \text{ tCO}_2\text{e/year}$$

4.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y	: Emission reductions in year y (t CO ₂ e/yr)
BE_y	: Baseline emissions in year y (t CO ₂ e/yr)
PE_y	: Project emissions in year y (t CO ₂ e/yr)
LE_y	: Leakage emissions in year y (t CO ₂ e/yr)

Emissions reductions will be calculated as:

$$ER_y = BE_y - PE_y - LE_y = 45,399 - 0 - 2,270 = 43,129$$

$$ER_y = 43,129 \text{ tCO}_2\text{e/year}$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
02-May-2022 to 31-Dec-2022	30,349	0	1,517	28,831
01-Jan-2023 to 31-Dec-2023	45,399	0	2,270	43,129
01-Jan-2024 to 31-Dec-2024	45,399	0	2,270	43,129
01-Jan-2025 to 31-Dec-2025	45,399	0	2,270	43,129
01-Jan-2026 to 31-Dec-2026	45,399	0	2,270	43,129
01-Jan-2027 to 31-Dec-2027	45,399	0	2,270	43,129
01-Jan-2028 to 31-Dec-2028	45,399	0	2,270	43,129
01-Jan-2029 to 31-Dec-2029	45,399	0	2,270	43,129
01-Jan-2030 to 31-Dec-2030	45,399	0	2,270	43,129
01-Jan-2031 to 31-Dec-2031	45,399	0	2,270	43,129
01-Jan-2032 to 01-May-2032	15,050	0	753	14,298
Total	453,990	0	22,699	431,290

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	QPW _{pp}
Data unit	Litres
Description	Average volume of drinking water per person per day
Source of data	Calculated based on survey records
Value applied	5.15
Justification of choice of data or description of measurement methods and procedures applied	QPW _{pp} data based on the survey records, what is conducted by participant project.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	LS
Data unit	Years
Description	Lifespan of water treatment technologies
Source of data	Manufacturer's specifications
Value applied	10
Justification of choice of data or description of measurement methods and procedures applied	Manufacture specifications
Purpose of Data	-
Comments	Lifespan of water treatment technologies shall be 10 years.

Data / Parameter	nwb
Data unit	%
Description	Efficiency of water boiling system being replaced
Source of data	Efficiency of the water boiling systems being replaced. Use one of the options below: The efficiency of the water boiling system shall be established using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of systems is encountered; 0.10 default value may be optionally used if the replaced system or the system that would have been used is a three stone fire or a conventional system for woody biomass lacking improved combustion air supply mechanism and flue gas ventilation system that is without a grate as well as a chimney; for the rest of the systems using woody biomass 0.2 default value may be optionally used; 0.5 default value may be used if the replaced system or the system that would have been used is a fossil fuel combustng system.
Value applied	10%
Justification of choice of data or description of measurement methods and procedures applied	This shall be determined based on option (b) detailed under the row above “Source of data” because only households who using three stone fine are taken into account for supplying safe drinking water.
Purpose of Data	Calculation of baseline emissions
Comments	The project proponents will distribute the SDWPs for the households who have used wood fuel to boil drinking water

Data / Parameter	$BL_{fuel,i}$
Data unit	Fraction
Description	Proportions of baseline fuel type I (NBR and or fossil fuels)
Source of data	Survey
Value applied	0.9502
Justification of choice of data or description of measurement methods and procedures applied	The baseline survey data show that the major source of fuel is fire wood
Purpose of Data	Calculation of baseline emissions
Comments	The baseline scenario established through the survey shows that 95.02% of the people used traditional stoves using woody biomass to boil water in the absence of the project activity.

Data / Parameter	f_i
Data unit	Fraction
Description	Factor to determine amount of non-renewable fuels
Source of data	Calculation
Value applied	0.7044
Justification of choice of data or description of measurement methods and procedures applied	For the wood fuel, the value established from “Calculation of the fraction of non-renewable biomass (fNRB) for Cambodia” report what was made by the Third Party Organization. This report estimates the fNRB for Cambodia using the latest guidance from the Clean Development Mechanism (CDM TOOL30 EB 115 Annex 22 v4.0 2022) “Calculation of fraction of non-renewable biomass”. With regards to the calculations, the third party organization analyzes the fNRB based on satellite data availability, Geographic Information System (GIS) and data modelling which provided the most reliable measuring method. For fossil fuel, the default value is 1.0
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{\text{projected fossil fuel}}$
Data unit	tCO ₂ /TJ
Description	Emission factor for the substitution of non – renewable woody biomass.
Source of data	AMS – III.AV, version 08.0 IPCC, chapter 2, table 2.2
Value applied	85.7
Justification of choice of data or description of measurement methods and procedures applied	As per AMS-III.AV, Version 08.0 and IPCC, Chapter 2, table 2.2
Purpose of Data	Calculation of baseline emissions
Comments	This parameter shall remain fixed for the monitoring periods

Data / Parameter	X _{boil}
Data unit	%
Description	Fraction of the population serviced by the project activity for which the common practice of water purification is or would have been water boiling.
Source of data	Survey
Value applied	0.9848
Justification of choice of data or description of measurement methods and procedures applied	X _{boil} data based on survey records
Purpose of Data	The data is used for baseline emission calculations.
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	Py
Data unit	Number
Description	Population who consumes the purified water serviced by the project activity in year y
Source of data	Survey Records
Description of measurement methods and procedures to be applied	A survey shall be conducted annually to check the number of persons who concern the purified water supplied by functional project appliances.
Frequency of monitoring/recording	Annual
Value applied	119,600
Monitoring equipment	-
QA/QC procedures to be applied	Data will be collected using standard procedures and will be kept for two years after the end of the crediting period or the last issuance of GHG Credits for this project activity, whichever occurs later.
Purpose of data	Calculation the baseline emission

Calculation method	Calculated by the quality of water purifiers are distributed x the average of number of people in a household.
Comments	-

Data / Parameter	QPWy
Data unit	litres
Description	Quantity of purified water in year y
Source of data	Calculated
Description of measurement methods and procedures to be applied	This parameter can be calculated based on equation: $QPWy = P_y \times \min(QPW_{pp}; 5.5) \times 365$
Frequency of monitoring/recording	Annual
Value applied	224,818,100
Monitoring equipment	-
QA/QC procedures to be applied	NA
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	m
Data unit	fraction
Description	Fraction of functional appliances that are providing the SDWP
Source of data	Microbiological testing report
Description of measurement methods and procedures to be applied	Every year, SWDP need to be tested on a sample basis (through a statistically representative sample) by an accredited Laboratory to ensure the following conditions that: They only use technologies that are meeting the SDWP Technology standards as per paragraph 4(b)

	- They are still operating or are replaced by an equivalent in service appliance. The use of appliances shall be monitored through self – report measures (survey data from respondents) as well as physical signs that are observable (e.g. wetness of the unit, water in storage receptacle, functionality of parts) as per “Objective measures of functionality and use of project appliances” describe in the Appendix - They are delivering microbiologically safe drinking water and shall met the Microbiological parameters required by Drinking Water Quality Standards for drinking water to deliver treated water verified to be <1cfu/100 ml E.Coli, using methods for measurement with a lower detection limit (LDL) of 1cfu E.Coli per 100 ml sample Emission reductions cannot be claimed if over 10% of appliances in the project activity fail to meet the final water quality requirements mentioned above.
Frequency of monitoring/recording	Annually
Value applied	1
Monitoring equipment	-
QA/QC procedures to be applied	The sampling plan shall also include provisions to collect information for records of replacement of appliances, filters and maintenance
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	A statistically valid sample of the appliances can be used to determine the parameter value, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". 95% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters
Data / Parameter	Check for SDWP public distribution network
Data unit	-
Description	Annual check if there is a public distribution network supplying SDWP is installed
Source of data	Confirmation from local authorities and survey at monitoring time

Description of measurement methods and procedures to be applied	Monitoring shall include annual check if there is public distribution network supplying SDWP
Frequency of monitoring/recording	Annually
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	If SDWP is made available through a public distribution network during the crediting period, the emission reductions pertaining to the households/buildings supplied by the public system cannot be claimed from that point onwards. This condition should be checked annually during the crediting period.

Data / Parameter	Quality of safe drinking water
Data unit	-
Description	The quality of the safe drinking water
Source of data	Project activity site
Description of measurement methods and procedures to be applied	At least every two years, SDWPs need to be tested by accredited Laboratory on a sample basis.
Frequency of monitoring/recording	Once every two years
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emission
Calculation method	-
Comments	Emission reductions cannot be claimed if project activity fails to meet SDWP standards

5.3 Monitoring Plan

The monitoring procedures and sampling plan for the grouped project is in-line with AMS- III.AV Low greenhouse gas emitting safe drinking water production systems (version 08.0) and the procedures outlined of the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities (version 09.0), which refers to the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (version 04).

1. Sampling design

a. Objectives and reliability requirements

As a rule, the most appropriate confidence/precision levels required by the methodology AMS-III.AV (version 08.0) and the Sampling Standard will be applied whenever sampling is undertaken. According to the Sampling Standard, 95/10 reliability is to be applied whenever sampling across a group of instances, which will typically be the case for this grouped project. In the case of conducting instance-specific sampling, the methodology AMS-III.AV (version 08.0) requires 90/10 confidence/precision if annual sampling is applied, or 95/10 confidence/prevision if biennial (every two years) sampling is applied.

The objective of the sampling effort will be to meet the monitoring requirements set forth in the methodologies AMS-III.AV (Version 08.0). Monitoring will be carried out on an annual basis (or biennial for specific parameters when allowed by the methodology. As the grouped project progresses and the number of instance increases, the sampling plan can apply to a group of instances. This will be applicable to instance types as long as homogeneity can be demonstrated. When homogeneity cannot be demonstrated the CME may monitor instances individually. All monitoring shall be coordinated by the CME.

Parameter	Description of parameter	Monitoring frequency
Py	Population who consumes the purified water serviced by the project activity in year y	At least annually
Check for SDW public distribution network	Annual check if there is a public distribution network supplying SDW is installed	At least annually
m	Fraction of functional appliances that are meeting the SDWP Standard	At least annually
Quality of safe drinking water	The quality of the safe drinking water	At least every two years

b. Target population

The target population (Users – including households) will be the total population served under the specific instance project activity or group of instances.

c. Sampling method

Sampling will be conducted using stratified random sampling techniques, and detailed calculations are provided within the monitoring plan as per CDM guidelines “Sampling and surveys for CDM project activities and programmes of activities”. Optionally, other sampling approaches may be used in accordance with “Sampling and surveys for CDM project activities and programmes of activities” and Guideline for Sampling and Surveys for CDM Project.

d. Sample size

The sample size will be calculated using the EB 86, “Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities”, version 04.0.

According to the “Standard for sampling and surveys for CDM project activities and programme of activities”, if there is more than one parameter to be estimated, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen as sampling effort with one common survey, or separate sampling efforts and surveys are undertaken for each parameter.

Thus, there are different equations to calculate a required sample size for different situations. Different equation that will be used, depends on the type of parameter of interest, that is either:

For all of the parameters a 90% confidence is required where the margin of error in the estimate is not more than 10% and assuming annual sampling for a single instance. If sampling is done across a group of instance or biennially, parameters shall have a 95% confidence level.

Below formulae assume sampling to be done across a group of instances and hence calculations are demonstrated with a 95% confidence level.

1. Parameter P_y

For population who consumes the purified water serviced by the project activity in year y (P_y), the equation that will be used is:

$$n \geq \frac{1.96^2 N \times p (1-p)}{(N -1) \times 0.1^2 \times p^2 + 1.96^2 \times p (1- p)}$$

Where:

n : Sample size
 $N=N_y$: Population who consumes the purified water serviced by the project activity in year y

p : Our expected proportion of the installed water purification systems will be in use and operating at the specified efficiency)

1.96 : Represents the 95 % confidence required

0.1 : Represents the 10 % relative precision

Substituting the values in above equation gives the value of n = [Number of users to be sampled] (rounded up).

The following assumptions are made to exemplify the sample size calculation for parameters: P_y

For project instance 1, the implementer will distribute 26,000 SDWPs and will provide clean drinking water to 26,000 households in Takeo province. Based on the baseline survey that showed a household size of 4.6 persons per household, the population size, N is taken as 119,600 persons.

It is expected at least 90% of households will be use drinking water from SDWPs, hence the expected proportion p for $N_{y,i,j}$ is taken as 0.9.

Based on the above assumptions, the resulting sampling size for a 95/10 confidence/precision is calculated as:

$$n \geq \frac{1.96^2 \times 119,600 \times 0.9 (1-0.9)}{(119,600 - 1) \times 0.1^2 \times 0.9^2 + 1.96^2 \times 0.9 (1- 0.9)}$$

Which comes out to be $n \geq 42.68$

$n = 43$

Therefore, in this case a sample size of 43 is to be sampled from each primary sampling unit.

In case the resulting sample size to achieve the desired confidence/precision levels is smaller than 30, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. The sample size is 43.

2. Parameter m

$$n \geq \frac{1.96^2 N \times p (1-p)}{(N - 1) \times 0.1^2 \times p^2 + 1.96^2 \times p (1- p)}$$

Where:

n : Sample size

$N=N_y$: Number of SDWPs in the target population

p : Our expected proportion of the installed water purification systems will be in use and operating at the specified efficiency)

1.96 : Represents the 95 % confidence required

0.1 : Represents the 10 % relative precision

Substituting the values in above equation gives the value of n = [Number of users to be sampled] (rounded up).

The following assumptions are made to exemplify the sample size calculation for parameters m
For project instance 1, the implementer will distribute 26,000 SDWPs and will provide clean drinking water to 26,000 households in Takeo province.

It is expected at least 90% of households will be use drinking water from SDWPs, hence the expected proportion p for $N_{y,i,j}$ is taken as 0.9.

Based on the above assumptions, the resulting sampling size for a 95/10 confidence/precision is calculated as:

$$n \geq \frac{1.96^2 \times 26,000 \times 0.9 (1 - 0.9)}{(26,000 - 1) \times 0.1^2 \times 0.9^2 + 1.96^2 \times 0.9 (1 - 0.9)}$$

Which comes out to be $n \geq 42.68$

$n = 43$

Therefore, in this case a sample size of 43 is to be sampled from each primary sampling unit.

In case the resulting sample size to achieve the desired confidence/precision levels is smaller than 30, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. The sample size is 43.

3. Check for SDW public distribution network

$$n \geq \frac{1.96^2 N \times p (1-p)}{(N - 1) \times 0.1^2 \times p^2 + 1.96^2 \times p (1 - p)}$$

Where:

n : Sample size

$N=N_y$: Number of SDWPs in the target population

p : Our expected proportion of the installed water purification systems will be in use and operating at the specified efficiency)

1.96 : Represents the 95 % confidence required

0.1 : Represents the 10 % relative precision

Substituting the values in above equation gives the value of n = [Number of users to be sampled] (rounded up).

The following assumptions are made to exemplify the sample size calculation for parameters:
Check for SDW public distribution network

For project instance 1, the implementer will distribute 26,000 SDWPs and will provide clean drinking water to 26,000 households in Takeo province.

It is expected at least 90% of households will be use drinking water from SDWPs, hence the expected proportion p for $N_{y,i,j}$ is taken as 0.9.

Based on the above assumptions, the resulting sampling size for a 95/10 confidence/precision is calculated as:

$$n \geq \frac{1.96^2 \times 26,000 \times 0.9 (1 - 0.9)}{(26,000 - 1) \times 0.1^2 \times 0.9^2 + 1.96^2 \times 0.9 (1 - 0.9)}$$

Which comes out to be $n \geq 42.68$

$n = 43$

Therefore, in this case a sample size of 43 is to be sampled from each primary sampling unit.

In case the resulting sample size to achieve the desired confidence/precision levels is smaller than 30, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. The sample size is 43

4. Quality of safe drinking water:

$$n \geq \frac{1.96^2 NV}{(N - 1) \times 0.1^2 + 1.96^2 \times V}$$

$$V = \left(\frac{SD}{mean} \right)^2$$

Where:

n : Sample size

$N = N_y$: Number of SDWPs in the target population.

1.96 : Represents the 95% confidence required

0.1 : Represents the 10% relative precision

Mean : Our expected mean

SD : Our expected standard deviation

Substituting the values in above equation gives the value of $n =$ [Number of user to be sample] (round up).

The following assumptions are made to exemplify the sample size calculation for parameter:
Quality of safe drinking water.

The project proponent will distribute 26,000 SDWPs under proposed instance. Hence, population size, N is taken as 26,000 SDWPS.

The expected mean of functional appliances that are meeting the SDWP Standard is 0.9 and its standard deviation is 0.09 for m .

Based on the above assumptions, the sample size calculation for a 95/10 confidence/precision would be

$$n \geq \frac{1.96^2 \times 26,000 \times (0.09/0.9)^2}{(26,000 - 1) \times 0.1^2 + 1.96^2 \times (0.09/0.9)}$$

Using above values, the sample size comes out to be 3.84 or 4

As the calculated sample size (for parameter of interest is a numeric mean value) is less than 30 samples, the Student's t-distribution will be used to calculate the sample size (in accordance with paragraph 13 of standard: sampling and survey for CDM project activities and programmes of activities (version 09.0))

As the sample size calculated above is less than 30, the Student's t-distribution has been used to calculate the sample size (in accordance with paragraph 13 of standard: sampling and survey for CDM project activities and programmes of activities (version 09.0)):

Monitoring Parameter	Fraction of functional appliances				
Sampling approach	Stratified random sampling based on water purifier year of distribution				
Stratum Number	Year of Distribution	Population Size	Expected Mean	Expected Standard Deviation	Calculated Sample Size
Year 2022	2022	26,000	0.9000	0.090	7
Sample size determination					
Mean					0.9000
Standard Deviation (SD)					0.0900
$V_{\text{mean}} = (SD/\text{mean})^2$					0.01000
Minimum Sample Size required					4
tDistribution sample size adjustment				Iteration 1	11
				Iteration 2	5
				Iteration 3	8
				Iteration 4	6
				Iteration 5	7
				Iteration 6	6

The adjusted sample size obtained after applying Student's t-distribution is 7. Therefore, in this case a sample size of 7 is to be sampled from each primary sampling unit.

For each of the parameter, sample sizes will be sufficient to ensure that the precision of the sample means/proportion are in accordance to the Sampling Frame established for the instance with in the grouped project to estimate emissions reductions. In cases where survey results indicate that desired precision is not achieved, the low bound of corresponding confidence interval of the parameter value may be used as an alternative to repeating the survey. Alternatively, the survey may be expanded to reach the required confidence/precision. The sampling methodology will be accordance with the representative sampling methods provided by the methodology AMS-III.AV (version 08.0) and other CDM sampling standard and guidelines as indicated along this section. There may be non-response from the target population. Thus, over sampling by 10% may be used to avoid non response; however, sampling may be ceased once required confidence/precision is met.

e. Sample Frame

The sampling frame refers to all the SDWPs in the database.

Implementers and different models of SDWP. As explained below, to take the different characteristics of different project proponent and SDWP models and other factors that may affect estimates into consideration, this project shall be either sampled separately and independently, or grouped together under a single sampling plan across instance, in each case using strata that have unique combinations of these factors.

The total number of appliances installed under the grouped project and operated per type of technology in that monitoring period will be the total sampling frame per distributed technology. Out of these appliances, samples will be selected for the respective appliance type. Random numbers will be generated and saved in a computer file and these will then be used to select the samples from the project database.

4. Data to be collected

a. Field measurements

Field measurement objectives and data to be collected are listed in section 5.3. The parameters to be sampled within this instance project activity as below:

Parameter	Description	Monitoring frequency
P_y	Population who consumes the purified water serviced by the project activity in year y	At least annually
Check for SDW public distribution network	Annual check if there is a public distribution network supplying SDW is installed	At least annually
m	Fraction of functional appliances that are meeting the SDWP Standard	At least annually
Quality of safe drinking water	The quality of the safe drinking water	At least biennially

To monitor the required parameters data will be collected from a statistically valid sample of SDWPs in the database for the monitoring period, as per this sampling plan. The method of collecting data will be field surveys and the frequency of data collection is as per the frequency defined for each parameter. Data will be collected from the field surveys, entered in the database and processed to be included in the monitoring.

The monitoring parameters are not subject to seasonal fluctuations as population numbers don't vary by season; appliances are either functional or not; and the quality of drinking water has to meet the required national standards.

The surveys for parameters P_y and m will be done by trained field personnel from the project proponent. Microbiological testing for parameter m and the Quality of safe drinking water will be established through an independent accredited laboratory in Cambodia.

As per approved methodology AMS-III.AV (version 08.0), the following guidance is being used for the representative sampling method:

"A statistically valid sample of the appliances can be used to determine the parameter value, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities". A 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters."

As per "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities", version 04, the following Sampling plan has been developed.

As per paragraph 3 of "Standard: Sampling and Surveys for CDM project activities and programme of activities", version 08.0," The general requirements of sampling methods shall be applicable to this project activity with any requirement specified in the applicable methodologies having precedence".

b. Quality Assurance/Quality Control:

The overall monitoring and the implementation of the sampling plan will be co-ordinated by the project proponent. They will ensure successful monitoring of the emission reductions of the proposed project during its crediting period. Furthermore, the survey of the representative sample for the parameters will be carried out by the project proponents together with the project proponents. The project proponents will sample for parameters P_y , m and Quality of safe drinking water as per the requirement of methodology.

During the survey, in order to anticipate any low response rate and answers bias, mechanisms for avoiding non-sampling errors (bias) include good questionnaire design, well-tested questionnaires, possibly pilot testing the data collection, 10% will be applied over the determined sample size. The survey team will ensure that all questionnaires are complete. There is one person check and one person review all questionnaires. To remedy the incomplete questionnaires, additional households will be drawn randomly until the required number is met at per the sample size determined. There might be changes of getting outliers while sampling.

The following approach will be used to identify and address outliers for the samples during monitoring. Outliers will be defined as those data points with values greater than three standard deviations from the mean of the sample.

Data points identified as outliers according to the above analysis will be examined further to correct for possible transcription and data entry errors, but will be omitted from the analysis if no such administrative errors exist.

All monitored data will be entered into the database. In case an error is made in data entry, ordinal copies of all monitoring documents will be kept and filed per. The name, date, and contact details of the survey or will be detailed on all completed monitoring surveys, therefore allowing for the follow-up of all incomplete/unclear data.

Hard copies of all documents will be kept at the office of project proponent, or an alternative address nominated by them, and all data entered into a central record keeping database. The record keeping database will be used to record the results of all monitoring, with all data stored to be kept for at least two years after the crediting period or the last issuance of VRs for the project activity.

c. Analysis

- The data from the survey will be analyzed
- To determine the Population who consumes the purified water serviced by the project activity in year y (Py)
- To determine the Fraction of functional appliances that are meeting the SDWP Standard (m)
- To determine the Quality of safe drinking water
- Data will be used for the preparation of monitoring reports for each instance or a group of similar instances. The results of all monitoring will be entered into the management database. Where it is found that an installed water purification system is no longer in use, the installation will be removed from inclusion in the instance project activity.

d. Implementation plan

Survey Implementation Schedule:

The survey for collecting the details of monitoring parameters will be conducted at least annually and will be scheduled during the last month of the monitoring period.

The overall monitoring and the implementation of the sampling will be co-ordinated by the project proponent and the management staff. They will ensure successful monitoring of the emission reductions of the proposed project during its crediting period. Furthermore, the survey of the representative sample for the parameters will be carried out by the distributor together with the project proponent.

The survey method has been used by project proponent include:

- Hard-copy questionnaires
- Face to face interview
- Telephone Interview

All sampling efforts will be conducted by qualified personnel who have undergone training as part of the grouped project. Any samplers will be required to speak the native language(s) in which water purification systems have been implemented, allowing for full understanding of any responses given by users, and any questions therein.

If sampling is to be carried out for a group of instance, monitoring may be carried out any time before the annual deadline for each instance project activity to be included in the sampling effort, and should be conducted annually thereafter. The date of all monitoring shall be recorded in the database.

5. Organizational Structure

The Sustainability Investment Promotion and Development Joint Stock Company (SIPCO) has a monitoring manager responsible for field staff training, QA/QC of the data, analysis and reporting into the monitoring report. SIPCO has a database manager who manages the process of collecting the information of installed SDWPs from the SDWP distributors and entering the data into the project database. For the monitoring survey, a monitoring team has been organized by the SIPCO consisting of survey coordinator, survey supervisor and trained monitoring staff, who conducted the surveys.

All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever is later.

Data Collection Team Organization Structure.

Monitoring Team			
The SIPCO (End user data checking and archiving)			
Field Staff (end user data collection)		Field Staff (end user data collection)	
End user	End user	End user	End user

APPENDIX 1: SUPPLY CHAIN (SCOPE 3)

Public statement has been posted on SIPCO's website:

<https://carbonvietnam.com/public-announcement-on-grouped-projects-for-cambodia-water-purifier-vcs-project-id-3052>

