



**Component project activity design document form for
small-scale CDM component project activities**

(Version 05.0)

Complete this form in accordance with the Attachment "Instructions for filling out the component project activity design document form for CDM small-scale component project activities" at the end of this form.

COMPONENT PROJECT DESIGN DOCUMENT (CPA-DD)

Title of the CPA	Water Kiosks in Cambodia – CPA 4
Version number of the CPA-DD	03
Completion date of the CPA-DD	26/10/2016
Title of the PoA to which the CPA is included	International Water Purification Programme CDM PoA 5962, registered on 16/11/2012
Host Party	Cambodia
Estimated amount of annual average GHG emission reductions	7,321 tCO ₂ e/year
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	AMS-III.AV. "Low greenhouse gas emitting water purification systems" (EB69, version 03)
Sectoral scope(s) linked to the applied methodology(ies)	3 : Energy demand

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

International water purification Programme
CDM PoA 5962, registered on 16/11/2012

A.2. Title of the CPA

Title: Water Kiosks in Cambodia - CPA 4
Version: 03
Date: 26/10/2016

A.3. Description of the CPA

The proposed small-scale CDM Programme Activity (hereafter referred as CPA) is developed under the Small-Scale Programme of Activities (PoA) titled “International water purification Programme”. It consists of the installation of small-scale water treatment stations (“water kiosks”) in Cambodia and distribution of purified water in disinfected water containers.

Inadequate access to microbiologically safe drinking water continuously threatens the health and well-being of more than a billion people, primarily in developing countries. In many areas worldwide the central water infrastructure is not available at all, or not reliable, leading to unsafe water at the tap. In such cases, decentralized water treatment can be used.

In Cambodia, around 34% of the rural population does not have access to an improved water source.¹ People in Cambodia who do not have access to safe water are forced to take water from unimproved sources, such as surface water and unprotected wells without any form of water treatment. This endangers the health and well-being of the population, especially children under five years old.

The CPA seeks to further the access of households and communities to clean and safe drinking water, using low greenhouse gas emitting water purification technologies at water treatment stations in rural areas.

The purification process illustrated in Figure 1 results from years of experimentation in Cambodia, which has enabled:

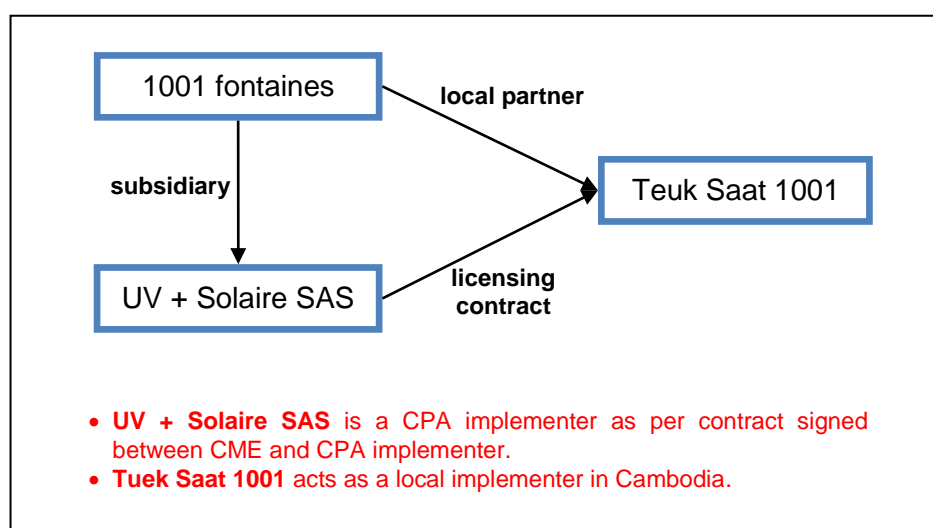
- fine-tuning of the model,
- testing different types of raw water (ponds and groundwater),
- adjusting various parameters (such as the iron-removing process), in order to make the solution technically compatible with operators’ skills and economic costs,
- adapting parameters related to raw water and treatment techniques, so as to produce drinking water that meets taste expectations of beneficiaries.

¹ Refer to value of Cambodia for 2012 in Annex 3: Country, area or territory estimates on sanitation and drinking water, Progress on Drinking Water and Sanitation - 2014 update by WHO / UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation Database
http://www.wssinfo.org/fileadmin/user_upload/resources/JMP_report_2014_webEng.pdf

This CPA is thus primarily designed for the long-term improvement of the living conditions of the local people of this rural part of Cambodia.

The CPA reduces the use and demand of non-renewable biomass that would have been used to boil the water as a mean of water purification in the absence of the CPA. This directly leads to reduced greenhouse gas emissions.

The CPA is a voluntary initiative taken by the coordinating/managing entity (CME) of the PoA, Pure Water Ltd., and implemented on a voluntary basis by UV + Solaire SAS which is a subsidiary of 1001 fontaines. Local implementation shall be conducted through Teuk Saat 1001, Cambodian NGO as a local partner of 1001 fontaines. UV+Solaire SAS and Tuek Saat has licensing contract for the use of intellectual property.



With no prospect, in the foreseeable future, of benefitting from the installation of piped water systems and sanitation facilities that would allow them to live, permanently, in an environment that is conducive to good health, UV + Solaire SAS provides small isolated villages with an alternative which consists in giving them the possibility to fulfil by themselves their most essential need, namely access to drinking water.

For villagers to be able to pay for drinking water, it is necessary to reach the lowest possible production cost. This explains certain technical choices, such as using surface water (or limited depth well drillings) or resorting to a technology (i.e. UV disinfection) that can be supplied by solar energy. Above all, a key element is to create local production capacities devoted to local consumption only, which allows reducing distribution costs to almost nothing.

Sustainability comes through the creation of a micro-enterprise operating each water production capacity. UV + Solaire SAS designed an operating mode which relied on entrusting a family with the responsibility to turn a water treatment unit into an economic activity, in the spirit of microfinance projects: the family produces water, bottles it and sells it in its village so as to achieve sufficient sales to cover its income, as well as the machine's maintenance costs.

This model achieves three goals at the same time: villagers can drink the minimum vital quantity of safe drinking water, an economic activity is created which allows a family to escape extreme poverty; and the sustainability of the operation is guaranteed by the personal interest that the said family operator has in keeping it running.

Contribution to Sustainable Development in Cambodia

The proposed CPA contributes to the sustainable development of the Cambodia's economy in a number of ways:

Environmental benefits

- The CPA will help significantly reduce Cambodia's greenhouse gas emissions over its lifetime.
- The CPA will help reduce the use of non-renewable biomass from Cambodia's 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.

Social benefits

- Purchasing or collecting firewood or fossil fuels to boil the water constitute a significant expense for the very poorest households and communities. The CPA will provide access to clean drinking water, which will reduce cost for families and thereby reduce child and adult morbidity and mortality, improve attendance at school, 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, thereby creating jobs and supporting families.
- There is a direct incentive to ensure that the projects have a successful long term operation as the carbon revenues will flow ex-post and condition to a successful monitoring phase.
- Polluted indoor air due to open and uncontrolled combustion is a huge health concern in Cambodia. Low greenhouse gas emitting water disinfection technologies tackle this problem by reducing the combustion of wood/fossil fuels.
- The CPA will alleviate the work burden of women and children as they have to spend less time to collect firewood for boiling water.

Economic benefits

The CPA will help develop a section of Cambodia's economy; in the installation of the devices, maintenance and monitoring.

The following timeline will be followed:

Date	Event
29/07/2011	Validation start date of IWPP (PoA)
16/11/2012	Registration of the PoA under the CDM of the UNFCCC.
24/01/2014	Cooperation Agreement between Pure Water Ltd. (the CME) and UV + Solaire SAS (the CPA implementer).
09/12/2014	Local Stakeholder Consultation based on Gold Standard requirements
11/04/2005 – 31/12/2011	First 42 pilot water kiosks were installed but not included in a CPA under the PoA
01/01/2012 – 31/12/2016	A total of 102 water kiosks has been installed for CPA 4
01/01/2017 – 31/12/2019	106 water kiosks will be installed for CPA 4

It is expected that the emission reductions will be approximately 7,321 tCO₂ for 208 water kiosks operating, thus meeting the small-scale eligibility criteria for Type III projects of a maximum of 60,000 tCO₂ emission reductions per year.

A.4. Entity/individual responsible for the operation of CPA

The small-scale CPA is implemented and operated by UV + Solaire SAS, which is a subsidiary of 1001 fontaines.

A.5. Technical description of the CPA

The project involves the construction of water kiosks in rural Cambodia and provision of ongoing support to water kiosk operators for operation and maintenance. The purification process illustrated in the following diagram:

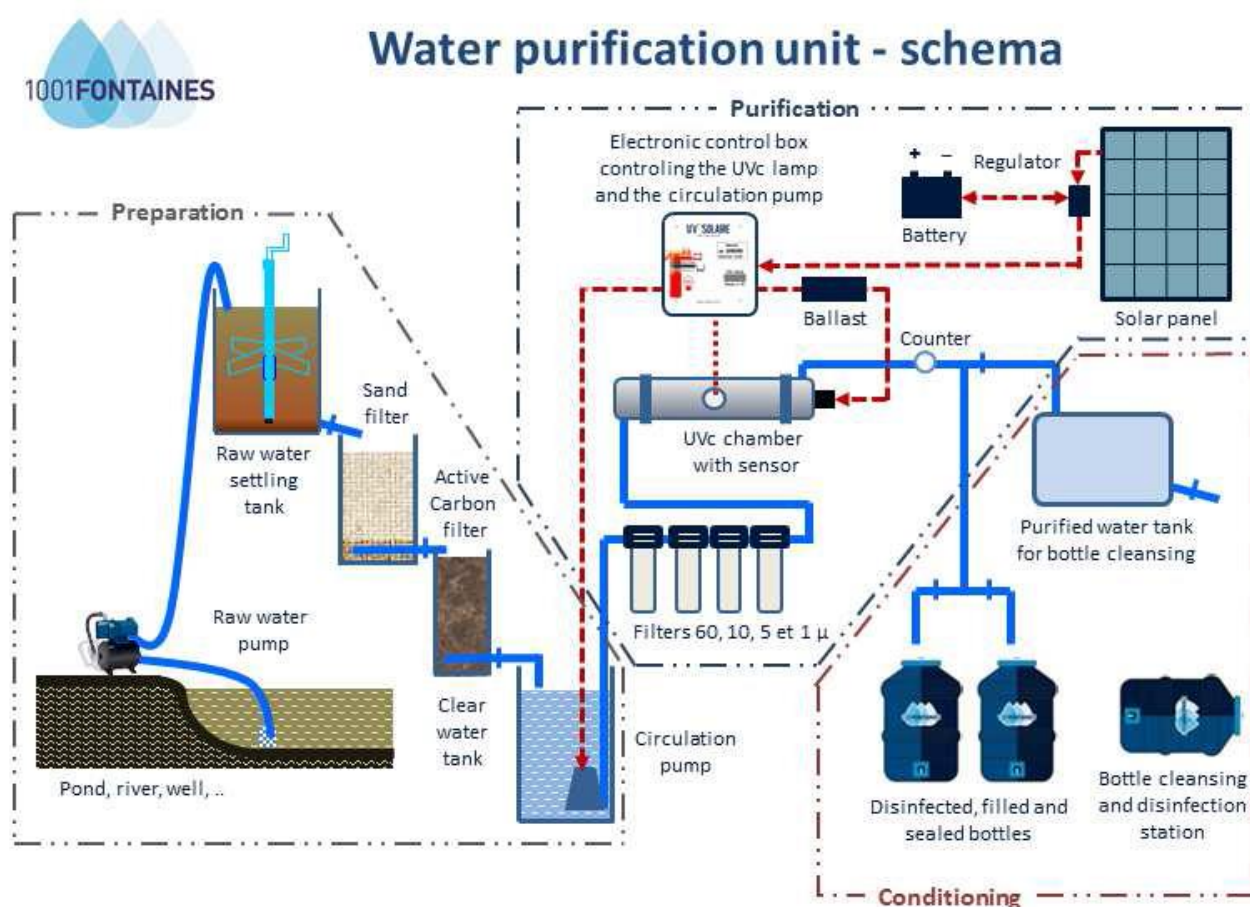


Figure 1: Purification process

The following operational procedure is followed:

Site Selection

UV+Solaire SAS, through a local partner (Teuk Saat), works closely with the government of Cambodia at the sub-national level to identify areas where creation of water kiosks would benefit the population. After identifying villages in need of safe drinking water options, Teuk Saat performs site investigations, determining areas where it is both technically feasible and appropriate to launch a water kiosk enterprise.

The capital costs of the water kiosks are covered by external donors. Water kiosks are grouped into clusters consisting of around 60 water kiosks and each cluster is supported by a "platform". The platform provides ongoing technical assistance to water kiosks.

Water Treatment Process

The applied treatment process consists of a flocculation, sand filtration, activated carbon filtration, micro-filter and UV disinfection. The purified water is filled into disinfected water 20 L containers and sold at the water kiosk and/or distributed locally. The treatment process may be adapted (e.g. by adding an iron-removing process) depending on the site-specific raw water quality as different water sources are used (borehole, bottled water, dug well, piped into dwelling, public tap, rainwater, surface water, and water vendor).

Operation and Maintenance

The local operator is responsible for the daily operation and maintenance of the water treatment plant and for the delivery of the purified water to the homes. Additionally, once the water kiosk operator reaches an economic breakeven point (selling more than 50 water containers a 20 L per day), the operator is responsible for a fee payment to the local platform (20% of the revenue). Most water kiosks start operating successfully and become financially self-sustaining within a short time period. The fee paid to the platform enables the platform team to provide monitoring, quality control, and support services to the operator.

Hardware specification	
UV lamp	Lamp power: 36W, 6A Life time: about 8000 hours of using
Motor pump	Maximum flow rate: 1500 l/min Life time : 3 years
Solar panel	12 VDC supply with regulator Life time: 20 years
Designed capacity	4,800 l/day ²

A.6. Party(ies)

Name of Party involved (host) indicates host Party	Private and/or public entity(ies) CPA implementer(s) (as applicable)	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Cambodia (Host)	UV + Solaire SAS (private entity) as CPA implementer	No
Switzerland	Pure Water Ltd. (private entity) as CME	No
Switzerland	Swiss Carbon Assets Ltd. (private entity)	No

A.7. Geographic reference or other means of identification

The physical boundary of the CPA is the households and communities that use the purified water where water kiosks are installed in 19 provinces in Cambodia. A database containing the GPS coordinates and unique IDs for all included water kiosks is available at the Teuk Saat office.

² Assuming 600 liters per hours over 8 hours per day.



Figure 2 Project location 19 provinces in Cambodia

The map above shows 19 provinces in Cambodia where water kiosks shall be set up by 2022.

The coordinates of the Teuk Saat office in Phnom Penh are: N11.537762, E104.913265 and the coordinates of each kiosk included in the CPA are updated in the database with the accessible link <https://www.google.com/maps/d/u/1/viewer?hl=en&authuser=1&mid=1wGpGbMP-qpc5CB1depF6i6pXbg>

A.8. Duration of the CPA

A.8.1. Start date of the CPA

17/11/2011 - The earliest date of construction contract signed after the validation start date of PoA which is the first water kiosk (F9) as part of CPA 4.

A.8.2. Expected operational lifetime of the CPA

The expected operational lifetime of the CPA is 21 years. The water kiosk hardware/equipment shall be maintained and replaced as per scheduled recommended by CPA implementer.

A.9. Choice of the crediting period and related information

Renewable crediting period of 7 years for the first crediting period, renewed twice and extended for a maximum length of 21 years was selected

A.9.1. Start date of the crediting period

01/01/2017

A.9.2. Length of the crediting period

The length of the 1st renewable crediting period is 7 years.

A.10. Estimated amount of GHG emission reductions

Emission reductions during the crediting period	
Years	Annual GHG emission reductions (in tonnes of CO ₂ e) for each year
Year 1	4,257
Year 2	5,509
Year 3	6,761
Year 4	8,681
Year 5	8,681
Year 6	8,681
Year 7	8,681
Total number of crediting years	7
Annual average GHG emission reductions over the crediting period	7,321
Total estimated reductions (tonnes of CO ₂ e)	51,251

A.11. Public funding of the CPA

The initial implementation has been funded through grants from different donors. However, none of the grants is declared as Official Development Assistance (ODA) and the proposed CPA will not involve any public funding.³

A.12. Debundling of small-scale component project activities

1. For the purposes of registration of a Programme of Activities (PoA)⁴ a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity⁵, which:
 - (a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same sectoral scope, and;
 - (b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

³ Letter of Confirmation on Non-Use of ODA is provided to DOE.

⁴ Only those POAs need to be considered in determining de-bundling that are: (i) in the same geographical area; and (ii) use the same methodology; as the POA to which proposed CPA is being added

⁵ Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity

2. If a proposed small-scale CPA of a PoA is deemed to be a debundled component in accordance with paragraph 2 above, but the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM and small-scale A/R project activities as set out in Annex II of the decision 4/CMP.1 and 5/CMP.1 respectively, the CPA of a PoA can qualify to use simplified modalities and procedures for small-scale CDM and small-scale A/R CDM project activities.

According to the Methodological tool “Assessment of debundling for small-scale project activities, v04.0 (EB 83, Annex 13, Para. 17) for determining the occurrence of de-bundling under a Programme of Activities (PoA)”, if each of the independent subsystem/measures included in the CPA of a PoA is not larger than 1% of the small scale threshold defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity.

The small-scale threshold defined by the methodology applied, AMS-III.AV version 03, is the annual emissions reductions 60,000 tCO₂e/y. Thus, 1% corresponds to annual emissions reductions of 600 tCO₂e/y.

For this CPA, the emission reductions per water kiosk (see section D.6.4. on emission reductions) are approximately 35 tCO₂e per year. Since this value is below the threshold of 600 tCO₂e/y, this CPA is therefore exempted from the de-bundling check.

A.13. Confirmation for CPA

The proposed CPA is neither registered as an individual CDM project nor is part of another registered PoA.

The CPA implementer has warranted that:

- The CPA has not been and will not be registered as a single CDM project activity or as a CPA under another PoA or as a carbon project under a voluntary scheme.
- The CPA Implementer is aware that the CPA will be subscribed to this present PoA.
- The CPA Implementer cedes its rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC or any voluntary scheme to the managing entity of this present PoA.

A.14. Contact information of responsible persons/ entities for completing the CDM-SSC-CPA-DD-FORM

South Pole Group, Santosh Kumar Singh, Regional Director SE Asia,
s.singh@thesouthpolegroup.com

Pure Water Ltd., Lars Osterwalder, Senior Consultant,
l.osterwalder@thesouthpolegroup.com

SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts

The PoA received the LoA from the DNA of Cambodia on 5th September 2014 and the CPA is in line with national environmental laws. No environmental impact assessment is required for the project according to the Host Country requirement.

SECTION C. Local stakeholder consultation

C.1. Solicitation of comments from local stakeholders

The local stakeholder consultation was organized according to the rules and requirements of the Gold Standard Foundation. A physical meeting was held on Tuesday, 9th December 2014 at 9:00 – 12:00 at S'ang Phnom Commune Council, Kandal Province, Cambodia. The 57 interested participants represented end users, local and national government, international and local NGOs. In the invitation letter sent to more than 100 people, the stakeholders were invited to provide feedback.

C.2. Summary of comments received

Stakeholder comment	Explanation
Concern about arsenic contamination and whether arsenic was removed in the treatment process	Water with an arsenic contamination above 500 ppb would not be used as source water. In cases where the source water contains less than 500 ppb, it would be treated in the purification process. It was also explained that regular water quality sampling and testing is done to ensure both the microbiological and chemical quality of the water.
Concern about health impact from smoke in the home when boiling water	Smoke from burning fuel can have an impact and that switching from boiling water to purchasing treated water was one way to reduce the amount of smoke in the home.
Question about the quantity of reduction in carbon emissions possible by switching from boiling water to kiosk treated water	When the entire water use across more than 200 water kiosks was factored in for an entire year, on the order of 18,000 tons of CO ₂ emissions reduction is possible. However it was explained that when calculating the reduction for a single use for a single household, the figure is very small.
Concern about the use of public water supply having an impact on CO ₂ emissions	Many people who use water from public water supplies are boiling it in their homes and thus there would be CO ₂ emissions associated with this use.
Concern about how CO ₂ emissions impact health and which people are affected	CO ₂ emissions contribute to climate change through global warming. Examples of climate change effects include rising sea levels increase in high intensity rainfall events, and flooding. It was also noted that Cambodia was among the countries highly vulnerable to climate change effects.
Question about who decides the price for water sold by the Teuk Saat kiosk	The price is \$0.30 - \$0.32 per 20L bottle or \$0.37 if the subscriber is far away from the kiosk. This price was agreed to with the community committee, and was an amount sufficient to provide for the operation and maintenance of the kiosk.
Suggestion to increase support towards providing safe drinking water to schools, as this was an important need.	UV + Solaire SAS will provide continued support towards safe water in schools.

C.3. Report on consideration of comments received

The stakeholders provided very valuable feedback that will be taken into account as the program continues to scale up. Nevertheless, none of the comments required an immediate adjustment of the implementation strategy. See explanations by CME and UV + Solaire SAS in section C.2.

SECTION D. Eligibility of CPA and estimation of emissions reductions

D.1. Reference of methodology(ies) and standardized baseline(s)

AMS.III-AV. Low greenhouse gas emitting safe drinking water production systems (EB69, version 3)

This methodology refers to the following methodology and tools:

- AMS-I.E. Switch from Non-Renewable biomass for thermal applications by the user (version 5)
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (version 2)
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1)

D.2. Applicability of methodology(ies) and standardized baseline(s)

AMS-III.AV requirements	SSC-CPA qualification justification
This methodology comprises introduction of low greenhouse gas emitting water purification systems to provide safe drinking water (SDW).	Under this CPA, water purification devices will be installed at communal water points. Solar powered UV-disinfection provides safe drinking water and qualifies as low greenhouse gas emitting water purification technology. The water kiosks will be set up by 1001 fontaines through Tuek Saat.
Water purification technologies that involve point-of use (POU) or point-of-entry treatment systems for residential or institutional applications such as systems installed at a school or a community centre are included. The examples include, but are not limited to water filters (e.g. membrane, activated carbon, ceramic filters), solar energy powered ultraviolet (UV) disinfection devices, solar disinfection techniques, photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (e.g. chlorination), combined treatment approaches (e.g. flocculation plus disinfection).	Under this CPA, water purification devices will be installed at communal water points. The CPA involves a point-of entry water treatment system and eligible under the applied methodology. (see request for clarification to the CDM SSC WG: F-CDM-SSCwgSC_673)
Prior to the implementation of the project activity, a public distribution network supplying safe drinking water (SDW) to the project boundary does not exist. If during the crediting period SDW is made available through a public distribution network the emission reductions pertaining to the households/buildings supplied by the public system cannot be claimed from that point onwards. This	No water purification devices are installed in communities with access to a reliable piped water supply system distributing safe drinking water. Thus prior to the implementation of this CPA, there is no public distribution network supplying SDW to the project boundary. If during the crediting period SDW is made available through a public distribution network, the emission reductions pertaining to the households/

condition should be checked annually during the crediting period.	buildings supplied by the public system area cannot be claimed from that point onwards. This condition will be checked annually during the crediting period (see section D 7.2.)
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) at a minimum the “interim” performance target as per “Evaluating household water treatment options: Health based targets and microbiological performance specifications” (WHO, 2011); or (ii) an applicable national standard or guideline.	As per “Evaluating household water treatment options: Health based targets and microbiological performance specifications” (WHO, 2011): Table A2.4. shows that UV light technology using lamp achieves a 3log removal for bacteria, a 2log for viruses and most protozoa and thus meets the ‘protective’ performance as shown in Figure 1 in the same document.
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 life span of the water treatment technologies is shorter than the crediting period of the project activity, and documented measures are in place to ensure that broken equipment will be replaced.
Leakage is estimated and accounted for as per the relevant provisions of AMS-I.E Version 05.0	Leakage is calculated by applying a net to gross adjustment factor of 0.95 to account for leakages.

D.3. Sources and GHGs

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

For this project activity, the project boundary includes the physical, geographical sites of 208 water kiosks for water purification installed by the project activity in Cambodia and the household where the consumers of safe water provided by those 208 water kiosks are located.

The sources and gases included in the SSC-CPA boundary are shown in the table below:

Source		Gas	Included?	Justification / Explanation
Baseline	CO ₂ emissions from fossil fuels/ Non Renewable biomass utilized for obtaining safe drinking water by boiling displace due to project activity.	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project Activity	CO ₂ emissions from consumption of fossil fuels and/or electricity for the operation of the project activity.	CO ₂	Yes	Main emission source from the consumption of grid electricity and fossil fuel consumed for transportation
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source

D.4. Description of the baseline scenario

According to the applied methodology, for a simplified and standardized approach it is assumed that fossil fuel or non-renewable biomass (NRB) is used to boil water as a mean of water purification in the absence of the project activity. Therefore the baseline scenario is the use of fossil fuel or NRB to boil water.

In Cambodia almost 90% of the rural population that is treating the drinking water is doing this by boiling (65.1% out of 72.5%⁶). Biomass cannot be considered as a sustainable source of energy as the fraction of non-renewable biomass was determined to be only 76%. In the baseline, the specific energy consumption for boiling water is calculated per household and compared with UV-disinfection, which is a low greenhouse gas emitting technology.

With the project, through the application of water purification at kiosk level, the need for boiling water is strongly reduced and further demand for water disinfection is suppressed. This leads to a significant emission reduction: On average one water kiosk (typically used by about 4,000 people) reduces or averts emissions by around 35 tCO₂e per year.

D.5. Demonstration of eligibility for a CPA

No.	Eligibility criteria		Means of proof	Confirmation
	Description	Conditions to be met		
1	Technology requirements	The water purification technologies include either: 1. Water filters (membrane, activated carbon, ceramic filters), solar energy powered UV disinfection devices, other solar disinfection techniques (SODIS), photocatalytic disinfection equipment, pasteurization appliances, chemical disinfection methods (chlorination), combined treatment approaches	Specification of water purification device: UV disinfection UV light Lifetime 8,000 hours	Yes , the CPA involves flocculation, activated carbon filtration, sand filtration, micro-filter and UV disinfection which are mentioned as low greenhouse gas emitting technologies in AMS-III.AV (version 3).

⁶ Source of data: Table 2.6 Household drinking water of Cambodia Demographic and Health Survey 2010

No.	Eligibility criteria		Means of proof	Confirmation
	Description	Conditions to be met		
		(flocculation plus disinfection) 2. A low greenhouse gas emitting technology: related ex-ante project emissions are less than 10% of the ex-ante baseline emissions calculated as per section B.6.3 of the CPA DD.		
2		Water purification technologies involve point-of use (POU) or point-of-entry treatment systems for residential or institutional applications such as systems installed at a school or a community centre	Specification of water purification device and CPA implementation plan mentioning the target users and the locations of the project (see section A.5.)	Yes , the CPA involves point-of-entry water treatment system and eligible under the applied methodology, see request for clarification to the CDM SSC WG: F-CDM-SSCwg SSC_673 ⁷
3		The application of the project technology/equipment achieves compliance either with: (i) at a minimum the “interim” performance target as per “Evaluating household water treatment options: Health based targets and microbiological performance specifications” (WHO, 2011); or (ii) an applicable national standard or guideline.	1. Evaluating household water treatment options: Health based targets and microbiological performance specifications (WHO, 2011) 2. National standards	Yes , the CPA involves technology that achieves compliance with WHO performance targets and national standards.
4	Applicability of the methodology	Prior to the implementation of the project activity, a public distribution network supplying safe drinking water (SDW) to the project boundary does not exist.	Interview with officials, end-users, NGOs, or local experts or published reports, maps, pictures, official documents	Yes , the CPA involves construction of water treatment stations only in areas where there is no access to public water distribution networks.
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.	Test report for water quality	Yes , the project implementer has provided measures to entrepreneur to ensure that UV light is replaced regularly and broken UV light is replaced. Further, sampling purified water shall be kept and tested by Tuek Saat laboratory on a monthly basis and at least biannual test will be sent out and tested by accredited laboratory.
6		Applicability of the methodology is foreseen in the following types of situations that shall be reassessed at the beginning of	Official data from Annex 3: Country, area or territory estimates on sanitation and drinking	Yes , the project qualifies for Case 2 as 66% of the rural population in Cambodia has access to

⁷ See request for clarification to the CDM SSC WG

<https://cdm.unfccc.int/filestorage/r/g/W8AG79EZV3YRP6N40QJKUMI5TL2BDH/Final%20response.pdf?t=UGt8bnlnY2QyfDAu9h57DgH-TXR4Nxc155Xt>

No.	Eligibility criteria		Means of proof	Confirmation
	Description	Conditions to be met		
		<p>each crediting period:</p> <p>(a) Case 1: Project activities implemented in rural or urban areas⁸ of countries with proportion of rural population using an improved drinking-water source equal to or less than 60% confirmed by one of the three options below:</p> <p>(i) Proportion of populations using an improved drinking-water source for the most recent year for which data is available from WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation shall be used (<http://www.wssinfo.org/dataestimates/table/>) for this purpose. Definition of improved and unimproved drinking water source shall be as per the information provided by JMP;</p> <p>(ii) Using official data such as publicly available statistical data from a government agency or an independently commissioned study by an international organization or an university;</p> <p>(iii) Using survey methods (use 90/10 confidence/precision for sampling);</p> <p>(b) Case 2: Project activities implemented in areas not included in case 1.</p>	water of the "Progress on Drinking Water and Sanitation - 2014 update" by WHO/UNICEFJMP	an improved source, which is more than the maximum 60% (see section D.6.1)
7	Boundary and location of the CPA	The CPA is located within one of the host countries listed in section A.5 of the PoA DD. CPA involves only one host country.	The CPA project boundary is limited to one host country, Cambodia	Yes , the CPA is located in Cambodia which has been expanded into the PoA's boundary since 06/11/2015. Please refer to the link: https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/RG9OBX48DCT65YUZV/03A7KELJ2SMFW/view
8	Avoidance of double counting	The CPA is exclusively bound to the PoA. Confirmation that the PoA has not been and will not be registered either as a single CDM project activity or as a CPA under another POA.	The specific CPA will not be part of another single CDM project activity or CPA under another PoA	Yes , the CPA is not part of another single CDM project activity or CPA under another PoA.

⁸ As per the WHO/UNICEF Joint Monitoring Programme for water supply and sanitation.

No.	Eligibility criteria		Means of proof	Confirmation
	Description	Conditions to be met		
9		A unique numbering or identification system for the water purification devices disseminated is applied.	Water kiosk database	Yes , a unique numbering system for water treatment stations will be applied.
10	Start date	<p>The CPA start date (first appliance sold or distributed) shall be after the PoA validation start date (webhosting date, i.e. 29/07/2011).</p> <p>In case any deployed water purification device are found not in line with CPA start date requirement, those devices will not be counted for emission reduction calculation.</p> <p>The CPA crediting period shall be limited by the PoA crediting period.</p>	<p>The start date of the CPA will be specified in each CPA-DD and is after 29/07/2011.</p> <p>CPA's first crediting period is 7 years, starting from 01/06/2016⁹, until 31/05/2023.</p> <p>The PoA crediting period is 28 years starting 16/11/2012, until 15/11/2040.</p>	Yes , the CPA start date is 17/11/2011, which is after the PoA registration date and the CPA crediting period will expire before the end of the PoA crediting period.
11	Additionality of CPAs	<p>The CPA shall satisfy the following additionality test based on the GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES (Version 09.0):</p> <p>The CPA shall solely be composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size¹⁰ of each unit is no larger than 5% of the small-scale CDM thresholds;</p>	<p>Calculation showing that the CPA remains below 60ktCO₂e per year. Evidence showing that each of the device achieves an annual emission reduction equal to or less than 3,000 tCO₂e per year.</p> <p>Evidence that the users shall be households or communities or Small and Medium Enterprises (SMEs), based on CPA implementation plan mentioning the target users or distribution records.</p> <p>Document: excel sheet calculation, technology specification, CPA implementation plan mentioning the target users or distribution records</p>	Yes , the ex-ante emission reduction estimated from each water treatment station is 35 tCO ₂ e per year, which is less than 3,000 tCO ₂ e per year. Users will be households and SMEs. Therefore the project is additional.
12	SSC Limit for CPAs	The annual emissions reductions of each CPA shall not go beyond the limits of 60 ktCO ₂ e/y over the entire crediting period.	Calculation showing emission reductions (see section D.6.4.)	<p>Yes, the ex-ante annual emission reductions of the CPA do not exceed 60 ktCO₂e/y over the entire crediting period.</p> <p>As per the ex-ante calculation, the maximum</p>

⁹ Expected inclusion date in the International Water Purification Programme

¹⁰ That is the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.

No.	Eligibility criteria		Means of proof	Confirmation
	Description	Conditions to be met		
				annual emission reduction per year is 7,321 tCO ₂ e.
13	Sampling requirements	The conditions related to sampling requirements for the PoA are in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys (Standard for sampling and surveys for CDM project activities and programme of activities, Version 03.0 and Guidelines for sampling and survey for CDM project activities and programme of activities Version 02.0) and are in line with the requirements of the applied methodology AMS.III.AV, version 3.	As specified in the sampling plan in the CPA-DD (see section D.7.2.) and according to the sampling requirements specified at PoA level	Yes , the sampling requirements are in accordance with the applied methodology and standards for sampling.
14	De-bundling	Each water purification device reduces less than 600 tCO ₂ e/y ¹¹ .	Calculation showing emission reductions per kiosk per year (see section A.12.)	Yes , each water kiosk reduces 35 tCO ₂ e/y which is less than 600 tCO ₂ e/y.
15	Contractual agreement	The CPA implementer has signed a contractual agreement with the CME to participate in the PoA. Such agreement guides the transfer of the emission reduction rights to the CME.	Contract between UV + Solaire SAS and the CME	Yes , UV + Solaire SAS (for UV + Solaire SAS has signed an agreement with Pure Water (CME) to participate in the PoA on 24/01/2014.
16	Local Stakeholder Consultation	A local stakeholder consultation has been conducted for CPA.	Local Stakeholder Consultation Report	Yes , the local stakeholder consultation was conducted on 09/12/2014.
17	Environmental Analysis	CPA is in line with the environmental host Party laws/regulations.	EIA exemption or EIA report.	Yes , the CPA is in line with environmental laws and regulations in Cambodia.
18	Diversion of official development assistance	CPA should not result into the diversion of official development assistance	Declaration from CME (see section A.11.)	Yes , the CPA does not result into the diversion of official development assistance.
19	Target group	CPA shall target households or communities or Small and Medium Enterprises (SMEs)	Survey Record	Yes , the CPA targets households, communities and SMEs for providing safe drinking water to households.

¹¹ According to the "Guidelines on assessment of debundling for SSC project activities, v03 (EB 54, Annex 13, par. 10) for determining the occurrence of debundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is not larger than 1% of the small scale threshold defined by the methodology applied, then that CPA of PoA is exempted from performing debundling check, i.e. considered as being not a de-bundled component of a large scale activity.

D.6. Estimation of emission reductions

D.6.1. Explanation of methodological choices

The small scale methodology AMS-III.AV requires methodological choices to be made as follows:

Paragraph 3: Determination of Case 1 or Case 2

- (a) *Case 1: Project activities implemented in rural or urban areas of countries with proportion of rural or urban population using an improved drinking-water source equal to or less than 60 % confirmed by one of the three options below:*
- (i) *Proportion of populations using an improved drinking-water source for the most recent year for which data is available from WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation shall be used (<<http://www.wssinfo.org/data-estimates/table/>>) for this purpose. Definition of improved and unimproved drinking water source shall be as per the information provided by JMP;*
 - (ii) *Using official data such as publicly available statistical data from a government agency or an independently commissioned study by an international organization or an university;*
 - (iii) *Using survey methods (use 90/10 confidence/precision for sampling)*
- (b) *Case 2: Project activities implemented in areas not included in Case 1.*

The data from Progress on Drinking Water and Sanitation says that 66% of the rural population in Cambodia has access to an improved source, which is more than the maximum 60%. Therefore, the CPA falls under **Case 2** requirement.

Paragraph 6. Quantity of purified water (cap)

QPW_y Quantity of purified water in year y (litres)

The quantity of purified water is the total amount of water treated by the project activity in year y . It should be directly monitored; alternatively, it should be based on (a) the population serviced by the project equipment, estimated using surveys and (b) an average volume of drinking water per person per day estimated using surveys or official data or peer reviewed literature or local expert opinion (a value of 5.5 litres per person per day shall not be exceeded)

In this CPA the quantity of purified water will be directly monitored using water meters.

Paragraph 7. Determination of the efficiency of the water boiling systems being replaced I

η_{wb} Efficiency of the water boiling systems being replaced

Use one of the options below:

1. *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 are encountered;*
2. *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 i.e. 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. Use weighted average values if more than one type of systems are encountered 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*

In this CPA Option 1 is used (see Appendix 4).

Paragraph 7. Determination of the efficiency of the water boiling systems being replaced II

T_i Initial temperature of water (°C)
Use annual Average ambient temperature; or
Use a default value of 20 °C

In this CPA the default value of 20 °C will be used.

Paragraph 11. Determination of the quantity of purified water

QPW_y *The quantity of purified water in year y shall be monitored as per the following options:*
a) On continuous basis or a representative sample thereof;
b) Derived from the capacity of the equipment established by manufacturers' specifications and the number of functional project appliances as per paragraph 10.

In this CPA the quantity of purified water will be directly measured using meters (option a).

D.6.2. Data and parameters fixed ex-ante

Data / Parameter	EF_{projected_fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission factor as per AMS-I.E procedures when NRB is displaced or the emission factor of the fossil fuel substituted
Source of data	AMS-I.E for NRB displacement, IPCC for other fossil fuel displaced
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	As per AMS-I.E, this value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis.
Purpose of data	Conversion of energy demand for boiling water (TJ) to carbon dioxide emissions (tCO ₂). Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	WH
Unit	kJ/L °C
Description	Specific heat of water
Source of data	AMS-III.AV version 03
Value(s) applied	4.186
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	T_f
Unit	°C
Description	Final temperature
Source of data	AMS-III.AV version 03
Value(s) applied	100

Choice of data or Measurement methods and procedures	Default value. Boiling point of water at standard conditions.
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	T_i
Unit	°C
Description	Initial temperature
Source of data	AMS-III.AV version 03
Value(s) applied	20
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	WHE
Unit	kJ/L
Description	Latent heat of water evaporation
Source of data	AMS-III.AV version 03
Value(s) applied	2,260
Choice of data or Measurement methods and procedures	Default value. The latent heat required to boil one liter of water for five minutes is assumed to be equivalent to latent heat for the evaporation of 1% of the water volume (WHO recommends a minimum duration of five minutes of water boiling) ¹²
Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	η_{wb}
Unit	-
Description	Efficiency of the water boiling system being replaced
Source of data	Baseline survey in 2014
Value(s) applied	13.31%
Choice of data or Measurement methods and procedures	<p>The prevalence of different cook stove types in the project area was determined in the baseline survey (see Appendix 4).</p> <p>A 0.10 default value is 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 i.e. without a grate as well as a chimney; for the rest of the systems using woody biomass 0.20 default value is used. 0.50 default value will be used if the replaced system or the system that would have been used is a fossil fuel combusting system. Use weighted average values if more than one type of systems are encountered.</p>

¹² WHO guidelines for Emergency Treatment of drinking water at point of the use
www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf

Purpose of data	Used for the calculation of the Specific Energy Consumption (SEC) of boiling water. Required for calculation of baseline emissions.
Additional comment	The water boiling systems and the fuel used in the baseline have been established via a baseline survey in July 2014.

Data / Parameter	f_{NRB}
Unit	-
Description	Non Renewable Biomass factor
Source of data	EB 67 Report Annex 22
Value(s) applied	76%
Choice of data or Measurement methods and procedures	Fraction of woody biomass used in the absence of the project activity in year y for Cambodia as per "Information note: Default values of fraction of non-renewable biomass for least developed countries and small island developing states (version 01.0)"
Purpose of data	Adjustment factor for baseline emission calculation. Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	L_P
Unit	Liters/appliance/day
Description	Capacity of the water purification equipment
Source of data	Manufacturer's specifications
Value(s) applied	4,800 (designed capacity)
Choice of data or Measurement methods and procedures	Capacity of the water purification equipment as per manufacturer's specifications shall be used in case where direct monitoring of the quantity of purified water is not possible.
Purpose of data	Used to monitor the quantity of purified drinking water together with the number of functional project appliances in case where direct monitoring of the quantity of purified water is not possible.
Additional comment	

Data / Parameter	POP_P
Unit	Person
Description	Number of persons supplied with purified water from each of the functional project appliances
Source of data	Ex-ante Survey
Value(s) applied	4,000
Choice of data or Measurement methods and procedures	For project activities falling under Case 2 per paragraph 3 (b), the number of persons supplied with purified water from each of the functional project appliances will be determined ex-ante.
Purpose of data	Used to calculate the cap of purified drinking water consumed for drinking purposes according to paragraph 6 in AMS-III.AV version 03. Required for calculation of baseline emissions.
Additional comment	The project activity falls under Case 2 per paragraph 3(b) in AMS-III.AV version 03, therefore this parameter is determined ex-ante.

Data / Parameter	DW_{POP}
Unit	Liters/person/day
Description	Average volume of drinking water per person per day

Source of data	Official data, WHO, minimum water quantity needed
Value(s) applied	3.5
Choice of data or Measurement methods and procedures	Official data used on average volumes of drinking water per person per day in emergency situation published by World Health Organization. ¹³ Conservative value as according to AMS-III.AV Version 03 a value of 5.5 liters per person per day shall not be exceeded.
Purpose of data	Used to calculate the cap of purified drinking water consumed for drinking purposes according to paragraph 6 in AMS-III.AV version 03. Required for calculation of baseline emissions.
Additional comment	

Data / Parameter	POP_{Boiling}
Unit	-
Description	Proportion of total population attended by the project that is serviced at households/buildings where water boiling would have been the purification practice.
Source of data	Official data (Table 2.6 Household drinking water of Cambodia Demographic and Health Survey 2010)
Value(s) applied	65.1%
Choice of data or Measurement methods and procedures	Official data for percentage of household in rural area using method of boiling to treat drinking water
Purpose of data	Adjustment factor applied to the cap of the quantity of purified water
Additional comment	Only relevant for Case 2

Data / Parameter	p_{i,y}
Unit	kg/L
Description	Density of diesel
Source of data	Table A3.8 of Energy Statistics Manual by OECD/IEA, 2005 ¹⁴
Value(s) applied	0.8439
Choice of data or Measurement methods and procedures	-
Purpose of data	Used to quantify the project emissions.
Additional comment	-

Data / Parameter	NCV_{i,y}
Unit	GJ/t
Description	Net calorific value of diesel
Source of data	table 1.2 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC ¹⁵
Value(s) applied	43.0

¹³ WHO SEARO, Minimum water quantity needed for domestic uses, 3 – 4 liters per person per day http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WHO/WHO5%20-%20Minimum%20water%20quantity%20needed%20for%20domestic%20use.pdf (last retrieved 26/11/2015)

¹⁴ http://www.iea.org/publications/freepublications/publication/statistics_manual.pdf (last retrieved 26/10/2016)

¹⁵ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (last retrieved 26/10/2016)

Choice of data or Measurement methods and procedures	-
Purpose of data	Used to quantify the project emissions.
Additional comment	-

Data / Parameter	EF_{CO₂,diesel,y}
Unit	tCO ₂ /GJ
Description	Emission factor of diesel
Source of data	table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC ¹⁶
Value(s) applied	74.1
Choice of data or Measurement methods and procedures	-
Purpose of data	Used to quantify the project emissions.
Additional comment	-

Data / Parameter	EF_{grid,CM,y}
Unit	tCO ₂ /MWh
Description	Emission factor for grid electricity in Cambodia
Source of data	Grid Emission Factor of the Phnom Penh Electricity Grid dated March 2011 ¹⁷
Value(s) applied	0.6568 (Combined margin: All other projects for the first crediting period)
Choice of data or Measurement methods and procedures	-
Purpose of data	Used to quantify the project emissions.
Additional comment	-

Data / Parameter	Leakage
Unit	-
Description	Fractional increase in NRB usage by households outside the project boundary
Source of data	AMS-I.E Version 5
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	Leakage related to the non-renewable woody biomass saved by the project activity will be assessed based on a net to gross adjustment factor of 0.95 to account for leakages. In this case surveys are not required. This is in line with the provisions in AMS-I.E Version 05.0.
Purpose of data	Calculation of leakage
Additional comment	

¹⁶ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (last retrieved 26/10/2016)

¹⁷ https://pub.iges.or.jp/system/files/publication_documents/pub/policyreport/2140/gef-cambodia_2011.pdf (last retrieved 26/10/2016)

D.6.3. Ex-ante calculation of emission reductions

Baseline emissions

The baseline emissions shall be calculated as follows, according to AMS.III-AV version 03:

$$BE_y = QPW_y * SEC * f_{NRB,y} * EF_{projected_fossilfuel} * 10^{-9} \quad (1)$$

Where:

BE_y	Baseline emissions during the year y in (tCO ₂ e)
QPW_y	Quantity of purified water in year y (litres)
SEC	Specific energy consumption required to boil one litre of water (kJ/L)
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year y
$EF_{projected_fossilfuel}$	Emission factor as per AMS-I.E procedures when NRB is displaced or the emission factor of the fossil fuel substituted (tCO ₂ /TJ). A default value of 81.6 tCO ₂ /TJ is used.

1) Water quality

The water quality shall be monitored on a monthly basis for contamination with Escherichia coli (E.coli). A presence/absence test for E. coli colony forming units (CFU) in 10 ml of water or an equivalent quantitative test for E. coli CFU shall be used. A presence of up to 10 E. coli CFU/100 ml shall be acceptable. The fraction of water quality measurements providing water of insufficient quality shall be excluded from the calculation of emission reductions.

To be conservative, it is estimated that 90% of all water kiosks comply with this quality threshold (Correction Factor_{water quality} = 90%).

2) Quantity of purified water, QPW_y

The total amount is subject to a cap derived from the population serviced by the project equipment POP_P multiplied by the average volume of drinking water per person per day based on official data. The average volume of drinking water is set at 3.5 liters per person per day and each water kiosk is expected to service 846 households. It is estimated that there will be 208 water kiosks to be installed for the project activity and 95% of all water kiosks will be functional at the end of each monitoring period. In addition, POP_{Boiling}, which is 65.1%, is applied.

Therefore, the Cap on quantity of purified water is calculated as follows:

$$\begin{aligned} QPW_{y,cap} &= N_y * POP_P * POP_{BOILING} * DW_{POP} * 365 \\ &= 208 * (846 \text{ households} * 4.73 \text{ people/hh}) * 65.1\% * 3.5 * 365 \\ &= 692,208,194 \text{ L/year} \end{aligned}$$

This CPA falls into Case 2 (more than 60% of the CPA population is using an improved drinking water source). The quantity of purified water is determined based on the number of water kiosks installed that will be functional during the crediting period, and the estimated volume of drinking water that can be treated by each functional water kiosks. The relevant estimates from the baseline survey and kiosk database are as follows for the ex-ante calculation:

$$\begin{aligned} QPW_{y, \text{monitored}} &= L_{P,current} * N_y * 365 \\ &= 1,625 \text{ L} * 108 \text{ kiosks} * 365 \\ &= 64,057,500 \text{ L /year} \end{aligned}$$

To be conservative, the lower value between $QPW_{y, \text{monitored}}$ and $QPW_{y, \text{cap}}$ is taken as the value of QPW_y .

Therefore, $QPW_y = \min (QPW_{y, \text{cap}}, QPW_{y, \text{monitored}}) = 64,057,500 \text{ L/year}$

3) Specific energy consumption, SEC

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

$$SEC = \left[WH * (T_f - T_i) + 0.01 * WHE \right] / \eta_{wb} \quad (2)$$

Where:

WH	Specific heat of water (kJ/L °C). Default value of 4.186 kJ/L °C is used.
T_f	Final temperature (°C). Default value of 100 °C ¹⁸ is used.
T_i	Initial temperature of water (°C). Default value of 20 °C is used.
WHE	Latent heat of water evaporation, a default value of 2,260 kJ/L is used
η_{wb}	Efficiency of the water boiling systems being replaced

According to the ex-ante survey conducted, the water boiling systems that are replaced are mostly three stone fire systems and the biomass used is wood.

Therefore, an efficiency of 13.31% is used. Please refer to Appendix 4.

Therefore $SEC = 2,686 \text{ kJ/L}$

4) Establishment of the Non Renewable Biomass factor, f_{NRB}

Project participants may use applicable default values, detailed formulas or approved tools provided by the UNFCCC to establish f_{NRB} , if available at the time of CPA inclusion.

The fraction of woody biomass used in the absence of the project activity is taken from the information note of the EB 67 Report Annex 22: "Default values of fraction of non-renewable biomass for least developed countries and small island developing states (version 01.0)"

A value of $f_{NRB} = 76\%$ is used for Cambodia.

5) Determination of emission factors ($EF_{\text{projected fossil fuel}}$)

The emission factor as per AMS-I.E procedures is taking the default value as 81.6 tCO₂ /TJ.

Therefore the annual baseline emission is calculated as follows:

$$\begin{aligned}
 BE_y &= QPW_y * SEC * f_{NRB, y} * EF_{\text{projected fossil fuel}} * 10^{-9} * \text{Correction Factor}_{\text{water quality}} \\
 &= 64,057,500 \text{ L/year} * 2,686 \text{ kJ/L} * 76\% * 81.6 \text{ tCO}_2/\text{TJ} * 10^{-9} * 90\% \\
 &= 9,603 \text{ tCO}_2/\text{year}
 \end{aligned}$$

¹⁸ Boiling point of water at standard conditions.

Project emissions

If the operation of the project water purification system involves consumption of fossil fuels and/or electricity, project emissions include:

- CO₂ emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the tool “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”

The project activity does not involve on-site consumption of fossil fuels, the project emissions are zero.

- CO₂ emissions from electricity consumption by the project activity using the latest version of the tool “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”.

$$\begin{aligned}
 PE_{EC,y} &= \sum EC_{pj,y} \times EF_{grid,CM,y} \times (1+TDL_{j,y}) \\
 &= (52 \text{ kWh/month} \times 208 \text{ kiosks} \times 12 \text{ months/year} \times 10^{-3}) \times 0.6568 \text{ tCO}_{2e}/\text{MWh} \times (1+28\%) \\
 &= 109 \text{ tCO}_{2e}
 \end{aligned}$$

However, the project activity involves transportation by road for delivery of bottling water, where transportation is not the main project activity. Therefore, the project emissions from transportation will be calculated as per the tool “Methodological tool: Project and leakage emissions from transportation of freight” using option A: monitoring fuel consumption.

$$\begin{aligned}
 PE_{FC,j,y} &= PE_{TR,m} = \sum FC_{i,j,y} \times COEF_{i,y} \\
 COEF_{i,y} &= NCV_{i,y} \times EF_{CO_2,i,y} \\
 &= 50 \text{ L/month} \times 0.8439 \text{ kg/L} \times 10^{-3} \times 43 \text{ GJ/t} \times 74.1 \text{ tCO}_2/\text{TJ} \times 208 \text{ kiosks} \times 12 \text{ months/year} \\
 &= 333 \text{ tCO}_{2e}
 \end{aligned}$$

Leakage emissions

Leakage relating to the non-renewable woody biomass is assessed as per the relevant procedures of AMS-I.E version 5 explained below:

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. Therefore, the leakage is calculated as follows:

$$\begin{aligned}
 \text{Leakage} &= BE_y \times (1-95\%) \\
 &= 9,603 \text{ tCO}_2/\text{year} \times (1-95\%) \\
 &= 480 \text{ tCO}_2/\text{year}
 \end{aligned}$$

D.6.4. Summary of the ex-ante estimates of emission reductions

Year	Baseline emissions (t CO ₂ e)	Project emissions (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions (t CO ₂ e)
Year 1	4,709	217	235	4,257
Year 2	6,094	281	305	5,509
Year 3	7,479	344	374	6,761
Year 4	9,603	442	480	8,681
Year 5	9,603	442	480	8,681
Year 6	9,603	442	480	8,681
Year 7	9,603	442	480	8,681
Total	56,695	2,610	2,834	51,251
Total number of crediting years	7			
Annual average over the crediting period	8,099	372	404	7,321

D.7. Application of the monitoring methodology and description of the monitoring plan

The monitoring plan as shown in the section D.7.1 and D.7.2 below is designed in accordance with the applied methodology AMS-III.AV version 03.

D.7.1. Data and parameters to be monitored

Based on AMS-III.AV version 03, following data will be monitored during the project crediting period:

Data / Parameter	QPW_y
Unit	Liters
Description	Quantity of purified water in year y
Source of data	Site Information Management System (SIMS) database
Value(s) applied	64,057,500 (derived from the capacity of the equipment) (ex-ante value)
Measurement methods and procedures	Monitored on a continuous basis using water meters. Monthly water consumption is reported by the water kiosk operators to the Tuek Saat office.
Monitoring frequency	Record of water consumption is reported to the office on a monthly basis
QA/QC procedures	In case a water meter is found to be non-functioning, emission reductions will not be claimed for the period the meter was not functioning.
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	N_y
Unit	-
Description	Number of functional project appliances (Kiosks) in year y
Source of data	Kiosk database
Value(s) applied	208
Measurement methods and procedures	The number of functional water kiosks will be maintained by kiosk database and will be updated on monthly basis to the Tuek Saat office. It will be checked that the water kiosks are still operating or replaced by an equivalent service appliance.
Monitoring frequency	Monthly

QA/QC procedures	<p>In case a water kiosk is not operating and has not been replaced, it will be excluded from the emission reduction calculation for the whole monitoring period considered, unless evidence of the date it broke down can be provided.</p> <p>The start date of each water kiosk, i.e. date of installation, will be considered to calculate the total amount of water purified during the year.</p> <p>Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.</p>
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	Existence of public distribution network supplying safe drinking water
Unit	-
Description	Existence of public distribution network supplying safe drinking water to the project boundary in year y
Source of data	Interviews with officials, end-users, NGOs, or local experts or published reports, maps, pictures, official documents, kiosk site database
Value(s) applied	<p>0</p> <p>There is no public distribution network supplying safe drinking water to the project boundary.</p>
Measurement methods and procedures	If during the crediting period SDW is made available through a public distribution network the emission reductions pertaining to the households / buildings supplied by the public system cannot be claimed from that point onwards.
Monitoring frequency	<p>Annually</p> <p>In case a safe drinking water network is found to exist, households receiving SDW will be identified via map, surveys, and/or pictures.</p>
QA/QC procedures	In case a SDW network is found to be existing, households related to this SDW will be identified via map, surveys, pictures, and emission reductions related to those households will be discounted accordingly considering the number of households linked to the network and the date the network became operational. It will be checked annually if new households from the project boundary are being linked to the network.
Purpose of data	Adjustment factor for baseline emission calculation
Additional comment	

Data / Parameter	POP_y
Unit	-
Description	Number of persons supplied with purified water from each of the functional project appliances
Source of data	Site Information Management System (SIMS) database
Value(s) applied	400
Measurement methods and procedures	For project activities falling under Case 2 per paragraph 3 (b), The number of persons supplied with purified water from each of the functional project appliances will be re-established for all devices at least once every two years.
Monitoring frequency	At least once every two years
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Adjustment factor for baseline emission calculation
Additional comment	Relevant because this CPA falls under Case 2

Data / Parameter	Water quality
Unit	-
Description	Water quality
Source of data	Test report
Value(s) applied	90%
Measurement methods and procedures	<p>The purified water shall be collected and tested by Tuek Saat laboratory on a monthly basis. At least biannual test will be sent out and tested by accredited laboratory.</p> <p>The applied technology complies with the “interim” performance target as per “Evaluating household water treatment options: Health based targets and microbiological performance specifications” (WHO, 2011). A presence/absence test for E. coli colony forming units (CFU) in 10 ml of water or an equivalent quantitative test for E. coli CFU shall be used. A presence of up to 10 E. coli CFU/100 ml in the treated water shall be acceptable.</p>
Monitoring frequency	Monthly
QA/QC procedures	The fraction of water quality measurements providing water of insufficient quality shall be excluded from the calculation of emission reductions.
Purpose of data	Adjustment factor for baseline emission calculation
Additional comment	

Data / Parameter	FC_{i,j,y}
Unit	litres
Description	Quantity of diesel consumed for delivery of bottling water
Source of data	Site Information Management System (SIMS) database
Value(s) applied	50 L/month/kiosk (ex-ante value)
Measurement methods and procedures	Monthly expenses on fuel consumption are captured in SIMS.
Monitoring frequency	Monthly
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Used to quantify the project emissions
Additional comment	

Data / Parameter	EC_{pj,y}
Unit	MWh
Description	Quantity of electricity consumed for water purification process
Source of data	Electricity invoice/bill
Value(s) applied	52 kWh/month/kiosk (ex-ante value)
Measurement methods and procedures	Monthly expenses on fuel consumption are captured in SIMS.
Monitoring frequency	Monthly
QA/QC procedures	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Purpose of data	Used to quantify the project emissions
Additional comment	

Data / Parameter	TDL_{i,y}
Unit	%

Description	Average technical transmission and distribution losses for providing electricity to the project activity
Source of data	Recent data available within the host country
Value(s) applied	28% (based on most recent value for Cambodia in 2013 ¹⁹)
Measurement methods and procedures	As per the guidance given in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", most recent data available within the host country will be used during monitoring and verification
Monitoring frequency	Annually
QA/QC procedures	Not applicable
Purpose of data	Used to quantify the project emissions
Additional comment	

D.7.2. Description of the monitoring plan

It is responsibility of the UV + Solaire SAS to monitor and record all parameters included in section D.7.1, under the guidance of the CME.

The monitoring is done as per the requirement of AMS-III.AV Version 3 and related tools to calculate project emissions. The detail of monitoring plan is described below:

- **AMS-III.AV Version 3**

Parameter	Means of monitoring	Monitoring frequency
Q _y	Data shall be monitored on a continuous basis using water meters. Monthly water consumption is reported by the water kiosk operators to the Tuek Saat office.	Monthly
N _y	The database of sites is maintained, with site currently in operation listed. In case any kiosk is found to be non-functional, it will be recorded and highlighted in monthly update and excluded from the emission reduction calculation. In case of any failure, kiosk operator can contact the Tuek Saat project manager to assess the cause of failure and fix or replace equipment.	Monthly
Existence of public distribution network of supplying safe drinking water	Sites where a public water distribution network is present shall be documented in the kiosk site database. Existing sites will be checked annually for new public distribution systems. In the event that distribution networks are providing safe water, the percentage of households connected to the network will be recorded and subtracted from the emissions calculations.	Annually
POP _y	The database keeps a monthly record of the number of individuals provided with water.	Monthly
Water quality	The chosen indicator is E. coli, and water must contain less than 10 coliform forming units (CFUs) of E. coli per 100 ml sample. Monthly water quality testing is conducted at the Teuk Saat laboratory with providing the number and list of sites that successfully met the water quality	Monthly

¹⁹ <http://wdi.worldbank.org/table/5.11>

Parameter	Means of monitoring	Monitoring frequency
	standard, and list of instances where the standard was not met. In the event that the fraction of water quality measurement providing water of insufficient quality shall be excluded from the emission reduction calculation.	

- **Tool to calculate baseline, project and/or leakage emissions from electricity consumption**

Parameter	Means of monitoring	Monitoring frequency
FC _{i,j,y}	Project emission will be calculated using the fossil fuel consumption, net calorific value and the emission factor of the fuel The fuel consumption shall be logged in daily expense record for each time of consumption done by the operator of each kiosk and summarized to monthly record sent to Tuek Saat office	Monthly

- **Methodological tool: Project and leakage emissions from transportation of freight**

Parameter	Means of monitoring	Monitoring frequency
EC _{pj,y}	Electricity consumption of the project activity shall be based on electricity meter readings, the applicable emission factor and transmission losses shall be determined in line with the Tool to calculate baseline, project and/or leakage emissions from electricity consumption In case the water kiosk consumes electricity from grid, the electricity invoice/bill shall be issued on monthly basis. The amount of electricity consumption will be taken from the invoice/bill.	Monthly
TDL _{j,y}	As per the guidance given in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", most recent data available within the host country will be used during monitoring and verification	Annually

Data management

(i) Field Measurements

The monitored parameters will be measured as indicated in section D.7.1.

(ii) Quality Assurance/Quality Control:

The potential for non-responses, refusals and related issues will be considered during sample selection. If the sampling results are insufficient to achieve the target reliability levels, the CME may request Teuk Saat to remedy this situation in a number of ways: Selecting a larger than necessary sample size before commencing monitoring can help to ensure that an adequate number of responses are obtained during monitoring. If it is necessary to engage third parties for carrying out field measurements, the CME will ensure that any such third parties are credible, experienced, and adequately trained for the tasks they are contracted for (e.g. carrying out water quality tests) in line with the noted methodology. Training will be provided to the parties carrying out the actual field measurements on how to deal with non-responses etc. if necessary.

The calculation of the sample size will be carried out using estimates for proportions, mean of values and standard deviations since the actual characteristics of the population/sampling frame are unknown ex ante. In order to ensure the quality of the sampling results, the CME can draw on the provisions for reliability calculations as provided by the Guidelines for Sampling and Surveys for CDM project activities and programme of activities Version 03.0. In the event that the sampling results do not fulfil the required level of confidence and precision, the CME will request Tuek Saat to sample additional clusters. If the reliability is still not sufficient after additional samples, the sampling may be repeated with an increased sample size. The data contained in each individual CPA Monitoring Record and collected during field measurements will be transferred to the CME by Tuek Saat.

(iii) Analysis:

The data obtained from sampling of each CPA will be used to estimate values for the parameters described above for use in GHG ER calculations.

Implementation

(i) Implementation Plan

It is envisaged that Tuek Saat will implement the Sampling Plan (Monitoring Plan) over the course of the PoA, including contracting all necessary third parties who would be responsible for actual field measurements, under the guidance of the CME. The actual timing will depend on the speed of CPA inclusion and water kiosk installation.

The skills and experience required for the data collection activities under the Sampling Plan may include:

- Experiences with field water quality testing
- Experience conducting door-to-door surveys
- Local language skills and English language skills
- Cultural awareness
- Numerical proficiency

SECTION E. Approval and authorization

The Letter of Approval for the proposed PoA was issued by the Cambodia DNA on 5th September 2014.

Appendix 1. Contact information of CPA implementer(s) and responsible person(s)/ entity(ies) for completing the CDM-SSC-CPA-DD-FORM

CPA implementer and/or responsible person/ entity	<input checked="" type="checkbox"/> CPA implementer(s) <input type="checkbox"/> Responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM
Organization	UV + Solaire SAS
Street/P.O. Box	33 rue Pierre Brunier
Building	
City	CALUIRE et CUIRE
State/Region	
Postcode	69300
Country	France
Telephone	
Fax	
E-mail	
Website	www.1001fontaines.com
Contact person	Rosemary O'Mahony
Title	
Salutation	
Last name	
Middle name	
First name	
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	r_omahony@yahoo.com

CPA implementer and/or responsible person/ entity	<input type="checkbox"/> CPA implementer(s) <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM
Organization	Pure Water Ltd.
Street/P.O. Box	Technoparkstrasse 1
Building	
City	Zurich
State/Region	
Postcode	8005
Country	Switzerland
Telephone	+41 43 501 35 50
Fax	
E-mail	
Website	www.thesouthpolegroup.com
Contact person	Lars Osterwalder
Title	Senior Consultant
Salutation	Mr.
Last name	Osterwalder

Middle name	
First name	Lars
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	l.osterwalder@thesouthpolegroup.com

CPA implementer and/or responsible person/ entity	<input type="checkbox"/> CPA implementer(s) <input checked="" type="checkbox"/> Responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM
Organization	Swiss Carbon Assets Ltd.
Street/P.O. Box	Technoparkstrasse 1
Building	
City	Zurich
State/Region	
Postcode	8005
Country	Switzerland
Telephone	+41 43 501 35 50
Fax	+41 43 501 35 99
E-mail	c.grobbel@thesouthpolegroup.com
Website	www.thesouthpolegroup.com
Contact person	Christoph Grobbel
Title	Managing Partner
Salutation	Mr.
Last name	Grobbel
Middle name	
First name	Christoph
Department	Administration department
Mobile	
Direct fax	+41 43 501 35 99
Direct tel.	+41 43 501 35 50
Personal e-mail	

Appendix 2. Affirmation regarding public funding

The confirmation letter on non-use of ODA and Annex D - official development assistance declaration are provided in order to the modes of funding for the project activity.

The initial implementation of the project is funded through grants from different donors, which none of the grants is declared as ODA.

Appendix 3. Applicability of methodology(ies) and standardized baseline(s)

The proposed project is eligible under the applied CDM methodology AMS-III.AV, 'Low greenhouse gas emitting safe drinking water production systems (EB69, version 3)' as demonstrated in section D.2. of this CPA-DD.

Appendix 4. Further background information on ex ante calculation of emission reductions

Baseline Survey

A baseline study was conducted by 1001 fontaines on July 3rd – 26th 2014, in order to determine the type of stoves and fuel used to boil water prior to the project implementation in target households in the CPA 4 project boundary. The baseline survey also investigated the prevalence of boiling among the target households to cross-check the value for POP_{Boiling} applied in the emission reduction calculation (DHS Cambodia 2010).

Target Population

As per the kiosk database²⁰, the communities that are or will be using the up to 772 water kiosks to be installed by 1001 fontaines over the next years in 18 provinces of Cambodia²¹. The project area comprises rural villages which can be considered as similar in terms of their living conditions, access to water and water treatment methods. The target population comprises a total of around 1.3 million households (based on the average number of households per water kiosk determined as part of the inspection of potential construction sites).

Sampling Method and Size

A multi-stage sampling approach has been chosen as the most suitable sampling method as per Guidelines for *Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 2.0)*, EB 69, Annex 5. It has been chosen to survey 10 households per site. Literature data and communications with local stakeholders suggested that three stone stoves fired by wood are most prevalent in the CPA project boundary. Improved stoves fired by wood, charcoal stoves and other type of stoves (e.g. LPG or electricity) were expected to be rare. Further, even though

²⁰ Electronic file '140623_Kiosk Database' has been submitted to DOE during validation.

²¹ Data planned for designing the survey for baseline study. However, during the validation the CPA implementer has provided updated data to be 19 provinces as mentioned in section A.7.

almost all households included in the sampling frame have or will have access to a water kiosk at one point in future, it is not possible to determine actual users of the kiosks ex-ante.

The required sample size was estimated using formula (16) on page 21 in *Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 2.0)*, EB 69, Annex 5. In order to achieve a 90% confidence interval and a 10% precision, a sample size of 17 water points with 10 households surveyed at each water point is required (based on the parameters listed in Table 1).

Table 1: Parameters to determine a sample size achieving 90/10 confidence/precision²²

Parameter	Value	Justification
Error Margin	10%	<i>Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 2.0), EB 69, Annex 5</i>
Confidence Level	1.645	<i>Represents the 90% confidence required. Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 2.0), EB 69, Annex 5</i>
Total number of groups	772	<i>Total number of existing and potential water kiosk sites as shown in the kiosk database</i>
Average units per group	1,683	<i>Average number of households per site as shown in the kiosk database</i>
Expected overall proportion	90%	<i>Expected proportion of households using a conventional, unimproved cook stove for boiling water. The remaining 10% are expected to use improved cook stoves fired by wood or charcoal.</i>
Expected unit variance	0.02	<i>Expected variance between users of different sites</i>
Expected average of the group variances	0.15	<i>Expected average variance of users of the same site</i>

The project team decided to invest some more time and resources in the baseline survey in order to achieve a higher precision of the result. In total 30 sites were selected randomly and at each water point 10 randomly selected households were visited.

Sampling Frame

From a comprehensive database²³ containing all 772 existing and potential sites of the water kiosks, a total of 30 villages were selected randomly using Microsoft Excel. All sites were sorted on a random number generated with the RAND() function which generates a random distribution. The lowest thirty values emerging out of this randomization then provided the 30 water points selected for the sample.

In each selected village 10 randomly selected households were visited and interviewed.

The following baseline survey was conducted to determine baseline stove efficiency²⁴.

²² The calculation sheet '140618_Sample Size MultiStage Baseline' for designing a sample size has been submitted to DOE during validation.

²³ Refer to the kiosk database which electronic file '140623_Kiosk Database' has been submitted to DOE during validation.

²⁴ Refer to the baseline survey results. Electronic file '140808_Baseline Results CPA4' has been submitted to DOE during validation.

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Cluster Number	Province	Commune	Code	Sampling Date	Number of households in the village	Conventional stoves fired by wood	Improved stoves fired by wood	Conventional stoves fired by charcoal	Improved stove fired by charcoal	Gas (LPG)	Biogas or electricity	Total
1	Banteay Mean Chey	Srah Chik	010305	23/07/2014	1,331	6	0	3	0	1	0	10
2	Battambang	Bansay Traeng	020209	17/07/2014	1,948	9	0	1	0	0	0	10
3	Battambang	Chrey	020204	17/07/2014	3,011	7	0	1	0	2	0	10
4	Battambang	Ou Char	020309	17/07/2014	3,114	4	0	3	0	3	0	10
5	Battambang	Ta Kream	020108	17/07/2014	4,078	6	0	3	0	1	0	10
6	Kampong Cham	Bos Khnaor	030201	08/07/2014	4,315	10	0	0	0	0	0	10
7	Kampong Cham	Chamkar Andoung	030202	09/07/2014	3,274	10	0	0	0	0	0	10
8	Kampong Cham	Khvet Thum	031304	08/07/2014	1,293	10	0	0	0	0	0	10
9	Kampong Cham	Krouch	031306	08/07/2014	1,349	10	0	0	0	0	0	10
10	Kampong Cham	Preah Theat	031107	07/07/2014	3,380	9	0	0	0	0	1	10
11	Kampong Cham	Soupheas	031512	08/07/2014	2,262	10	0	0	0	0	0	10
12	Kampong Chhnang	Dar	040402	16/07/2014	1,366	10	0	0	0	0	0	10
13	Kampong Chhnang	Longveaek	040505	26/07/2014	1,526	9	0	0	0	1	0	10
14	Kampong Speu	Krang Chek	050505	10/07/2014	2,675	8	0	2	0	0	0	10
15	Kampong Thom	Kakaoh	060704	09/07/2014	2,364	9	0	1	0	0	0	10
16	Kampot	Angkor Meas	070509	04/07/2014	1,425	8	1	0	0	0	1	10
17	Kandal	Preaek Anhchanh	080703	10/07/2014	2,986	6	0	0	0	3	1	10
18	Kratie	Sandan	100408	25/07/2014	1,442	10	0	0	0	0	0	10
19	Preah Vihear	Kampong Sralau Muoy	130207	24/07/2014	518	4	0	5	0	1	0	10
20	Preah Vihear	Kampong Sralau Pir	130208	24/07/2014	327	5	0	5	0	0	0	10
21	Prey Veng	Preaek Changkran	141207	07/07/2014	1,550	10	0	0	0	0	0	10
22	Pursat	Sna Ansa	150309	16/07/2014	1,010	10	0	0	0	0	0	10
23	Siem Reap	Samraong	171109	22/07/2014	1,844	10	0	0	0	0	0	10
24	Svay Reang	Kraol Kou	200510	14/07/2014	2,446	9	0	0	0	0	1	10
25	Svay Reang	Prasat	200804	14/07/2014	491	9	0	0	0	1	0	10
26	Svay Reang	Svay Rieng	200601	14/07/2014	2,936	7	1	0	0	1	1	10
27	Takeo	Angk Ta Saom	210901	03/07/2014	3,157	7	1	0	0	1	1	10
28	Takeo	Kampong Reab	210606	03/07/2014	1,421	6	2	0	0	1	1	10
29	Takeo	Kdanh	210607	03/07/2014	1,418	8	2	0	0	0	0	10
30	Takeo	Leay Bour	210904	03/07/2014	4,225	9	1	0	0	0	0	10
Total (Number)						245	8	24	0	16	7	300
Total (%)						81.7%	2.7%	8.0%	0.0%	5.3%	2.3%	100%
Default stove efficiency (%)						10%	20%	10%	20%	50%	n.a.	
Fraction of non-renewable fuels (%)						77%	77%	77%	77%	100%	0%	
Weighted average stove efficiency			12.17%									

Wood is the predominant fuel in the project area, used in 84.3% of all households. Charcoal stoves (8.0%) and LPG stoves (5.3%) are only seen in rare occasions. 89.7% of all firewood and charcoal stoves sampled are considered as conventional (= 10% efficiency) and 2.7% as improved (= 20% efficiency). The LPG stoves are assumed to have a thermal efficiency of 50% (according to the applied methodology), however, the fraction of non-renewable biomass is 100% in these cases, thus f_{NRB} is adjusted to 78.3%. 7 out of 300 households use electricity or biogas for cooking. As this is

a very small number and the applied methodology does not provide further guidance on such cases, these households were excluded from the baseline calculation.

The required 90/10 confidence/precision requirement is clearly met with 90% confidence that the prevalence of unimproved cook stoves is 90.8% (+/- 5.0%).

The weighted average stove efficiency in the project area of CPA 4 is estimated to be 12.17% and the f_{NRB} adjusted to 78.3%.

The baseline survey suggests that 61% of the target population is or would be boiling their drinking water if they had sufficient time and money. Even though this value does not fulfill the required 90/10 confidence/precision requirement, it confirms that the applied value of 65.1% (DHS Cambodia 2010) is an appropriate estimate for $POP_{Boiling}$ in the project area.

During the DOE site visit on June 9th – 11th 2015 the DOE conducted a sampling survey²⁵ in the provinces of Kampong Cham, Kampong Speu and Kandal and the DOE noted that 80% of the population were using improved cook-stoves. The baseline survey conducted above (during July 3rd – 26th 2014) however showed that more than 80% of households rely on conventional cook stoves.

To further substantiate this, we have provided additional supportive documents as below:

- page 27 of <https://cleancookstoves.org/binary-data/RESOURCE/file/000/000/225-1.pdf>
- page 4 of <https://cleancookstoves.org/binary-data/RESOURCE/file/000/000/224-1.pdf>

It can be clearly seen that more than 80% of the population still uses traditional cook-stoves. Furthermore, if we refer to the project id – GS 103000000001910²⁶, page 18 of the PDD shows that 60% are traditional stoves using wood as the fuel. It should also be noted that we have not applied factors for suppressed demand in Cambodia and therefore our estimates are conservative.

For the sake of conservativeness and to take into account the observations from the DOE's site visit we have revised the number of households using improved cook-stoves in the provinces visited by the DOE, and the resulting efficiency is 13.31%²⁷.

²⁵ Electronic file 'Survey result_Jun2015' has been submitted to DOE during validation.

²⁶ https://mer.markit.com/br-reg/public/project.jsp?project_id=103000000001910

²⁷ Electronic file '140808_Baseline Results CPA4_updated' has been submitted to DOE during validation.

Appendix 5. Further background information on monitoring plan

Monitoring information is provided in section D.7.2 of the CPA-DD.

Appendix 6. Summary of post registration changes

Not applicable.