PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 10.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Production and dissemination of Ceramic Water Purifiers by Hydrologic, in the Kingdom of Cambodia, GS1020.
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	11.2
Completion date of the PDD	05/02/2018
Project participant(s)	Hydrologic Social Enterprise
Host Party(ies)	N/A
Sectoral scope and selected methodology(ies)	Sectoral Scope(s): 1 – Energy Industries (renewable/non-renewable sources) 3 – Energy Demand Selected Methodology: Gold Standard Methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption" Version 3.0– July 2015"
Estimated amount of annual average GHG emission reductions	84,706

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Background:

In 2002, the NGO International Development Enterprise (IDE Cambodia) introduced Ceramic Water Purifiers (CWPs) into Cambodia as a way to filter safe drinking water for Cambodian households. These units will treat contaminated drinking water, and reduce the demand for conventional water treatment through boiling water with non-renewable biomass.

The CWPs can be manufactured using locally available skills and are simple, low cost and easy to use. In December 2010, IDE spun off its CWP manufacturing program, which then became *Hydrologic Social Enterprise*. This new entity seeks to disseminate over 325,000 units between 2011 and 2017. So far up to 324, 480[1] filters has been sold by April 2017 and it is expected that by Nov 2017, the total sold unit will be well above 325,000 unit as forecasted.

Since 2002, the CWP program at IDE, as well as other CWP manufacturing programs in Cambodia, has relied solely on donor funding. These NGO's have had external funding to set up production and to ensure full cost coverage. The CWP manufacturing in Cambodia would not have been possible without external funding since all CWP's have been sold at non sustainable prices below cost for the CWP operation. No CWP program has been commercially viable. Consequently, the water purification initiatives are not viable as they cannot be sustained beyond the duration of the donor financing. With the assistance of carbon finance, this project can be economically sustainable and provide a significant improvement in public health and household welfare.

This project has provided access to adequate levels of clean drinking water to an estimated 1.77 million people across 325,000 households over 7 years. For the next 7 years of crediting period 2 (CP2, Dec 2017- Nov 2024), based on the previous sale data, a linear regression forecast for CP2 sale has been made. It is estimated that about 350,325[2]. CWPs will be sold in which about 1.64 million people would have access to clean water.

Contribution to Sustainable development:

Water-borne disease is a leading cause of illness in the developing world, contributing to the death of two million children every year, on average. Globally, 884 million people are without access to safe drinking water and more than 2.6 billion lack access to basic sanitation. Lack of access to water killed more children annually than AIDS, malaria and measles combined, while the lack of sanitation affects 2.6 billion people - 40 per cent of the global population. The UN has acknowledged that safe, clean drinking water and sanitation are integral to the realization of all human rights (UN General Assembly 2010[3]).

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[1] HSE_CP2_ER_Cal_20171023, Tab units per month, Sum of cells D6:D82.

[2] Based on projected sales of 350,325 over 7 years. Assume one water filter per household, assume 4.68 people per household as per baseline report: Angkor Research and Consulting (2017)*"Baseline Survey Report on Ceramic Water Purifier by Hydrologic in the Kingdom of Cambodia". 350,325 HH * 4.68 persons per HH = 1,639,521 people.*

[3] UN (United Nations) (2010) *General Assembly Adopts resolution recognizing Access to Clean Water, Sanitation as Human Right, by recorded vote of 122 in Favour, None Against, 41 Abstentions*. GA/10967. Sixty-fourth General Assembly Plenary 108th Meeting (AM). Pg. 1. [Online] Available from: http://www.un.org/News/Press/docs/2010/ga10967.doc.htm [Accessed 28th November 2011].

In Cambodia, a health survey in 2014 found that 13% of under-5 children had experienced diarrhea in the preceding 2 weeks (National Institute of Public Health and National Institute of Statistics, 2015[4]). Research also finds that diarrheal diseases are the most prevalent cause of death in children under 5 years old in Cambodia (Brown, J. and Sobsey, MD., 2010).

This project directly addresses several of the United Nations Millennium Development Goals (MDGs), including goal 4 and 7, and especially to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation. With the new target under the Sustainable Development Goals (SDG), the project address SDG 3, 6 and 13, especially SDG6.1, to achieve universal and equitable access to safe and affordable drinking water by 2030[5]

It also integrates the principles of sustainable development into country policies and programmes and reverses the loss of environmental resources; reducing child mortality, improving maternal health, combating disease, ensuring environmental sustainability, and developing a global partnership for development.

The Hydrologic Ceramic Water Purifier (CWP) is a point-of-use microbial water treatment system intended for routine use in low-income settings.
The system can filter enough to supply drinking water for a family of five. Studies on similar filters have indicated effective life spans of up to five[6] or seven years[7] .

In addition, Hydrologic completed water quality tests about the ceramic water filters produced at Hydrologic's factory using an independent lab and the results show 99.99% removal of bacteria[8]. This illustrates very well that CWPs are effective tool to purify water.

In a UNICEF-funded study conducted in Cambodia by the University of North Carolina it was determined that the "time in use for filters in households was about 2 years, on average, before disuse. This suggests that filters can be used reliably for extended periods and also that users valued the filters enough to keep using them, usually until breakage".[9]

The most common reason for discontinued use was breakage of the ceramic filter element, spigot, or container.[10]

With the current two-year warranty policy and good after sale service, it is observed that the filters can be used up to five years. Based on the average usage rate from monitoring period 1 (MP1) to monitoring period 5 (MP5), the usage rate of CWP's group age of 0-1, 1- 2, 2-3, 3-4, 4-5 years old was 91.67%,

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[4] National Institute of Statistics and Directorate General for Health, 2015, Cambodia Demographic and Health Survey 2014

[5] United Nation. General Assembly 2015, Resolution adopted by the General Assembly on 25 September 2015, *Transforming our world: the 2030 Agenda for sustainable development*, viewed 21 Sept 2017, http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

[6] Campbell (2005) *Study on Life Span of Ceramic Filter - Colloidal Silver Pot Shaped (CSP) Model*. Potters for Peace. Managua.

[7] Lantagne D. 2001. *Investigation of the Potters for Peace Colloidal Silver-Impregnated Ceramic Filter: Intrinsic Effectiveness and Field Performance in Rural Nicaragua*. Alethia Environmental, Allston MA

[8] Hydrologic (2016) *Laboratory tests of bacteria removal using ceramic water filters manufactured by Hydrologic in Cambodia*

[9] Brown J. Sobsey M. and Proum S. 2007. *Improving Household Drinking Water Quality: Use of Ceramic Water Filters in Cambodia.* WSP Field Note. World Bank Water and Sanitation Program. Phnom Penh p27.

[10] Brown J. Sobsey M. and Proum S. 2007. *Improving Household Drinking Water Quality: Use of Ceramic Water Filters in Cambodia.* WSP Field Note. World Bank Water and Sanitation Program. Phnom Penh p13.

84.31%, 74.19%, 65.39% and 82.92%, respectively. Cumulative weighted usage rate was 75% during the 5th verification period.

The CWP system requires no energy input or consumables. This reduces the use of non-renewable biomass (mostly firewood) for water treatment by boiling. This directly leads to reduced CO2 emissions.

The socioeconomic benefits of access to clean drinking water are well documented, and include reduced time spent provisioning water, reduced cost for families, reduced child and adult morbidity and mortality, improved attendance at school and increased productivity.

The scenario existing prior to the project activity:

Due to the poor quality of available drinking water sources and the lack of centralized systems for delivering safe water to households, the reality for most Cambodians today is that they must collect water, store it for use in the household, and treat and protect it themselves if they are to have safe water. Cambodia has a population of 13 million people (NIS, 2009). Approximately 66% or 9 million Cambodians live without access to improved water sources (NIS 2004).

Based on the Cambodia demographic and health survey (2014), 35 % and 16% of households do not have access to improved drinking water sources in dry and rainy season respectively. Surface water in Cambodia is often plentiful but generally of poor quality, due in part to inadequate or nonexistent sanitation in rural areas. About 44% of Cambodians do not have access to adequate sanitation facilities (National Institute of Statistics and Directorate General for Health, 2015). Surface water and shallow groundwater (often of poor microbiological and aesthetic quality) and rainwater catchment (susceptible to contamination during collection and storage) are the principal alternatives to arsenic-contaminated deep wells.

Because large scale public treatment systems may be decades away for many Cambodians, Point of Use (POU) treatment is the best option in terms of cost and removal capabilities. According to the baseline report[11], 62.75% of total surveyed households claimed that they treat water before drinking while 37.25% said they don't do treat water before drinking. The most commonly practiced POU water treatment is boiling, used by 57.75% of people. Furthermore, boiling water is quantitatively prohibitive in that a family cannot boil more water at one time than their largest cooking container. Boiled water often also becomes contaminated during storage (PATH, 2010).

Fuel used for water boiling in Cambodia is predominantly nonrenewable biomass. The baseline report (2017) shows that the fuels used are: firewood (68.18%), charcoal (6%), and LPG (20%).

The Purpose of the Ceramic Water Filter Program:

For this 2nd crediting period, the ultimate objective of the ceramic water purifier program remains the same as that of the 1st crediting period is to provide safe drinking water to Cambodian people, especially those in rural areas. The project aims to solve the problems described in the baseline scenario above, by using locally made CWPs to effectively remove up to 99% of bacteria[12][13][14].

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[11] Angkor Research and Consulting (2017)*"Baseline Survey Report on Ceramic Water Purifier by Hydrologic in the Kingdom of Cambodia"*

[12] Roberts M. 2003. *Ceramic Water Purifier – Cambodia Field Tests*, IDE Cambodia, Phnom Penh, pp 4-6

[13] Brown J. Sobsey M. and Proum S. 2007. *Improving Household Drinking Water Quality: Use of Ceramic Water Filters in Cambodia.* WSP Field Note. World Bank Water and Sanitation Program. Phnom Penh, pp22-32.

The project has three specific objectives:

1. To disseminate over 325,000 units over 7 years
2. To ensure maintenance and operation of disseminated units meet standards for water quality
3. To strengthen and facilitate establishment of institutions for the continued and sustained development of the CWP program.

With the carbon credits, Hydrologic is expecting to carry out its activities to achieve the above objectives as done during its first crediting period. The project will only include filters produced in the Hydrologic purpose-built factory.

Description of partners involved with Hydrologic

iDE

iDE is a U.S.-based international non-profit, non-governmental organization with a market-based approach to poverty reduction. iDE helps to build profitable enterprises and value chains that deliver sustainable social and economic benefits to the rural poor, enabling them to increase their income and improve their quality of life. IDE works primarily in rural areas and in two sectors that are critical for rural livelihoods: water, sanitation, and hygiene (WASH) and agriculture. iDE introduced the Ceramic Water Purifier (CWP) technology to Cambodia in 2001. This project was eventually spun off as Hydrologic in 2009. iDE is the current 100% owner of Hydrologic.

Nexus for Development

Nexus is a global alliance of social ventures (non-profits, NGOs, and eco-businesses) whose central mission is to reduce climate change while alleviating poverty. It is an integrated carbon services platform for awareness raising, carbon auditing, capacity building, carbon project development, and carbon asset management. Nexus is an incorporated non-profit organization in Singapore. For Hydrologic, Nexus provides technical input into the preparation of carbon finance application to the Gold Standard Foundation. Nexus builds the capacity of Hydrologic staff through mentoring and training to manage the project through the carbon finance project cycle. Nexus also provides carbon asset management services through a dedicated sales platform and sales team.

WaterSHED

The Water, Sanitation and Hygiene Enterprise Development project (WaterSHED) is a USAID-funded public private partnership designed to bring effective, affordable water and sanitation products to market in Cambodia, Laos and Vietnam. From 2009 through 2011, WaterSHED provided technical and financial support to Hydrologic to increase production capacity, strengthen sales and distribution, incorporate the company, and initiate an application for a carbon financing.

PATH

PATH is a U.S.-based international non-profit organization that develops appropriate technologies and strategies to improve global health and well-being. Over the past 26 years, PATH has developed, tested, implemented and refined innovations for global scaling of vaccines, contraceptive products, and essential health goods. In Cambodia, PATH has provided technical and financial support for i) the design of a modified version of the CWP product that is aspirational in appearance and ii) testing of multiple direct

[14] Bloem S.C. 2008. *Silver Impregnated Ceramic Water Filter - Flowrate versus the removal efficiency of pathogens*. Delft University of Technology, Faculty of Applied Sciences, Delft, Netherlands

and retail distribution and sales strategies. PATH also conducted in-depth market segmentation research for point-of-use water treatment in Cambodia.

Vision Fund

Vision Fund Cambodia is a micro-finance institution (MFI) offering a range of loan products to the rural poor. Vision Fund's financial service delivery extends and complements World Vision's development projects with a strategic focus to reach out to the vulnerable poor to help them establish their own lives in a secure, healthy and dignified manner. Vision Fund works with Hydrologic to develop a method for promoting CWPs through group meetings and providing a credit option for CWP purchasers.

Antenna Technologies Foundation

Antenna is a Geneva-based non-profit that works to reduce extreme poverty and health problems in developing countries by bringing innovation in science and technology to bear at the Base of the Pyramid. They support the development and dissemination of a range of durable technologies which are low-cost and simple in their use, and appropriate to the basic needs and socio-cultural conditions of the poorest of the poor. Antenna is providing financial support to Hydrologic to expand commercial sales channels for the CWP.

Years	Estimation of annual emission reductions[15] in tonnes of CO2e
Dec 2017	7,527
2018	91,773
2019	83,659
2020	85,833
2021	84,427
2022	82,884
2023	82,228
Jan – Nov 2024	74,608
Total estimated reduction (tonnes of CO2e)	592,939
Total number of crediting years	7 years
Annual average of the estimated reductions over the crediting period (tonnes of CO2e)	84,706

A.2. Location of project activity

A.2.1. Host Party(ies)

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Kingdom of Cambodia (national)

A.2.2. Region/State/Province etc.

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All

[15] This emission reduction calculation could be revised during the validation and GS review.

A.2.3. City/Town/Community etc.

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All

A.2.4. Physical/Geographical location

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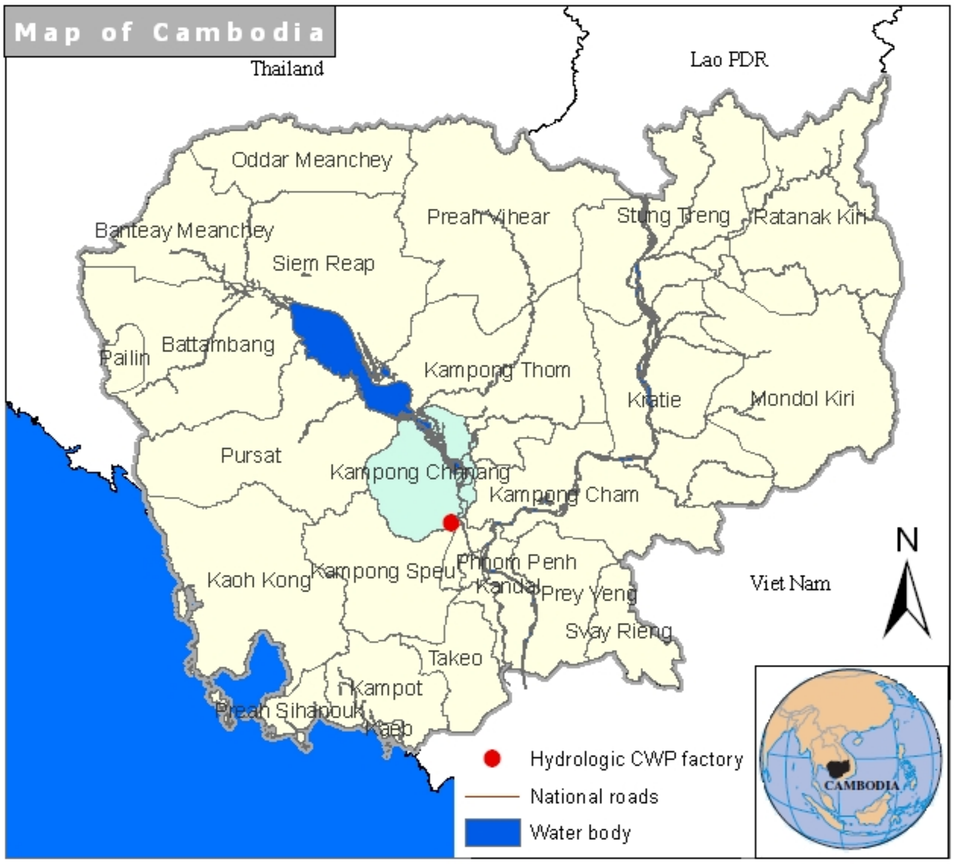
Hydrologic's Office:
House 97A, Street 15BT (Ta Phon), Sansom Kosal 1, Boeung Tumpun
Phnom Penh,
Cambodia

Hydrologic's factory:
Trapeang Samrong Village, Sub-district of Longveak,
District of Kompong Tralach,
Province of Kompong Chnang

	Coordinates
Latitude	11.8504° N
Longitude	104.7419° E



A.3. Technologies and/or measures

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End-Use Energy Efficiency Improvement:

Voluntary Gold Standard methodology: "Technologies and Practices to Displace Decentralized Thermal Energy Consumption"[16]

Ceramic filtration is the use of porous ceramic (fired clay) to filter microbes or other contaminants from drinking water. Pore size can be made small enough to remove up to 99.99% bacteria.

Locally produced ceramic pot-style filters have the advantages of being lightweight, portable, relatively inexpensive, chemical free, low-maintenance, effective, and easy to use. The filters provide for removal of microorganisms from water by gravity filtration through porous ceramics, with typical flow rates of 2-3 liters per hour.

CWP cool the treated water through evapotranspiration and, used with a proper storage receptacle, safely store water for use. There are no significant taste issues, they have functional stability in the sense that they have only one moving part (the tap) and require no external energy source (such as UV lamps) or consumables (such as chlorine packets, or media that must be regenerated or replaced). The ceramic filter surface is regenerated through regular scrubbing to reduce surface deposits.

Hydrologic CWP's have a potentially long useful life of 5+ years (Lantagne 2001[17]; Campbell 2005[18]) with proper care and maintenance. The useful life of a ceramic filter depends on the frequency of cleaning, and thus the quality of water being treated, and the thickness, since repeated cleaning will eventually wear away the filter surface. End-users have the possibility to replace broken parts or the entire unit at no cost thanks to the warranty system thus extending the lifespan of the CWP – the warranty system is financed by carbon credits. The project proponent will monitor usage rates in accordance with the methodology to ensure that only units in use are credited.

Filters are produced at Hydrologic's purpose-built factory and then sold through three main channels:

i) Direct sales to end users by hydrologic sales staff
ii) Retailers who purchase wholesale CWPs and sell them to end users or local intermediaries
iii) NGOs that purchase wholesale CWPs and typically sell them at a subsidized price.

Filters are made locally in Cambodia providing a source of income to poor communities.

Description of the Ceramic Water Filter:

The Ceramic Water Purifier consists of a porous, pot-shaped filter element made of kiln-fired clay impregnated with colloidal silver. The clay pores act as a physical barrier to micro-organisms and the silver acts as a bactericide.

• The ceramic filter element is set in a plastic receptacle tank with a lid and spigot to protect filtered water from recontamination.

• Raw water seeps through the ceramic filter element by gravity at a rate of 2 to 3 liters per hour producing potable water.

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[16] The Gold Standard (2015) *Technologies and Practices to Displace Decentralized Thermal Energy Consumption.* [Online] Available from: https://globalgoals.goldstandard.org/uncategorized/401-13-tpddtec-gold-standard-technologies-and-practices-to-displace-decentralized-thermal-energy-consumption, [Last Accessed 21st September 2017].

[17] Lantagne, D. (2001) *Investigation of the Potters for Peace Colloidal Silver Impregnated Ceramic Filter – Report 1: Intrinsic Effectiveness.* Pg. 58. [Online] Available from: http://pottersforpeace.org/wp-content/uploads/alethia-report-2.pdf [Last Accessed 28th November 2011].

[18] Campell, E. (2005) *Study of life span of colloidal silver impregnated ceramic filter. Presented to Potters for Peace*. Par. V. [Online] Available from: http://pottersforpeace.org/wp-content/uploads/filter-longevity-study.pdf [Last Accessed 28th November 2011].

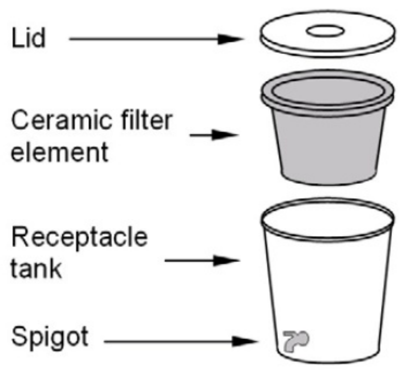
• The filter element holds approximately 10 liters, allowing a family to produce 30 liters of water per day with three fillings, or more if required.

•Maintenance consists of scrubbing the ceramic filter element to unclog pores and washing the receptacle tank to prevent bacterial growth.

• The ceramic filter element has an average lifespan of two years or more. Lifespan depends on the quality of the input water and the care taken to avoid breakage. The receptacle and spigot are expected to last five years.

1. Tunsai CWP

Tunsai Ceramic Water Purifier Elements:



Tunsai Ceramic Water Purifier Data:	
Filter Element Type	Ceramic Clay Pot
Filter Capacity (volume)	Approx. 10 L
Filter Capacity (flow)	Typ. 2-3 L/Hr Typ. 30L/day
Receptacle Type	Closed safe storage food grade plastic receptacle
Receptacle Storage Capacity (volume)	Approx. 12 L
Spigot Type	Plastic
Plastic Type	Food grade polypropylene

2. Super Tunsai CWP

Super Tunsai Ceramic Water Purifier Elements:

Super Tunsai Ceramic Water Purifier Data:	
Filter Element Type	Ceramic Clay Pot
Filter Capacity (volume)	Approx. 10 L
Filter Capacity (flow)	Typ. 2-3 L/Hr Typ. 30 L/day
Receptacle Type	Closed safe storage food grade plastic receptacle
Receptacle Storage Capacity (volume)	Approx. 14 L
Spigot Type	Plastic
Plastic Type	Food grade polypropylene

As described above, there are 2 types of water filters: Tunsai CWP and Super Tunsai water filter. Both have the same characteristics as illustrated above, with the only difference being the size of the receptacle and the design.

These differences do not affect the estimates in carbon reduction, both products have the exact same ceramic pot and the difference is with the size of the tank where the clean water is stored and with the design which does not affect the performance of the CWP. For carbon credit purposes, the ceramic pot processes the same amount of water in both products, therefore it is considered only one size product.

Below is the description of how the technology works.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Cambodia (host)	Hydrologic	No

A.5. Public funding of project activity

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Prior to recent funding support from USAID/ WATERSHED, the project was actually planned to be discontinued. USAID/ WATERSHED funding has provided seed capital for the past 2 years (FY 2009-2010 and Jan-Mar 2011) that allowed Hydrologic to spin off from IDE, continue distributing water filters, and search for alternative sources of revenue. The project developer does not expect future funding from USAID/ WATERSHED.

PATH also provided funding which was used to fund a pilot project to develop a model for direct sales by commissioned sales agents. The funding is available until December 2011 and the project developer does not expect to receive further funding after that.

Antenna provided financial support in November 2011 to expand commercial sales channels for the CWP.
If the situation changes in the future, GS will be notified.

The revenue from the sale of emissions reductions credits will be critical to Hydrologic becoming an on-going, sustainable enterprise capable of providing emissions-free household water treatment options to rural households.

"Hydrologic[19]", has never publicly announced any plans to launch a new production facility, nor to operate independently without the support of external financing.

Since 2002, the CWP program at IDE, as well as various other CWP manufacturing programs in Cambodia, has relied on donor funding. These NGO's have had external funding to set up production and to ensure full cost coverage. The CWP manufacturing in Cambodia would not have been possible without external funding since all CWP's have been sold at non sustainable prices below cost for the CWP operation. No CWP program has been commercially viable. Consequently, the water purification initiatives are not sustainable as they have not been demonstrated be replaced beyond the duration of the donor financing. With the assistance of carbon finance, this project can be economically sustainable and provide a significant improvement in public health and household welfare.

A.6. History of project activity

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1. PP would like to confirm that:
   a. The proposed project is neither registered as CDM project nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA).

[19] Hydrologic Social Enterprise (formerly of International Development Enterprises – Cambodia) hereinafter referred to as hydrologic

b. The proposed project is not a project activity that has been deregistered

2. PP would like to declare that:
    a. The proposed project activity was not a CPA that has been excluded from a registered CDM PoA;
    b. There was not a registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed project activity.

A.7. Debundling

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Not applicable.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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The following approved Gold Standard Foundation baseline and monitoring methodology is applied to the project activity:

Title**:** Voluntary Gold Standard methodology: "Technologies and Practices to Displace Decentralized Thermal Energy Consumption" Version 03, July 2015.

Reference: Gold Standard Website:
https://globalgoals.goldstandard.org/uncategorized/401-13-tpddtec-gold-standard-technologies-and-practices-to-displace-decentralized-thermal-energy-consumption

Additionality for the project activity is demonstrated using the Annex 03 Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0) and the guidelines for additionality as per the Gold Standard methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 3– July 2015" on page 9.

B.2. Applicability of methodology

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This methodology is applicable to programs or activities introducing improved cook-stoves or water treatment technology (e.g. water filters) and practices to households and institutions that result in improved kitchen regimes within a distinct geographical area. The following conditions apply:

1. The project boundary can be clearly identified, and the technologies counted in the project are not included in another voluntary market or CDM project activity (i.e. no double counting takes place). Project proponents must have a survey mechanism in place together with appropriate mitigation measures so as to prevent double-counting in case of another similar activity with some of the target area in common.
    a. The project boundary is clearly identified as described in section A.4.1 and B.3 of the PDD.
    b. PP has put in place appropriate mitigation measures to prevent double counting as described in section B.7.2.8

2. The technologies each have a continuous useful energy output of less than 150kW per unit (defined as total energy delivered from start to end of operation of a unit divided by time of operation). For technologies or practices that do not deliver thermal energy in the project scenario but only displace thermal energy supplied in the baseline scenario, the 150kW threshold applies to the displaced baseline technology.
    a. Water filters do not deliver energy output but only displace thermal energy supplied in the baseline scenario which delivers less than 150kW per technology. As per the research from Aprovecho Research Center[20], a three stone stove (open fire) has an output of 7.50kW, a 5L Portable rocket stove with skirt (improved cook stove) has an output of 5.00kW and a large 45L Institutional stove has an output of less than 20kW per unit. All of them are well below the threshold.

3. The use of the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology (i.e. discounted price for the improved technology) and the definitive discontinuity of its use. The project documentation must provide a clear description of the approach. The project documentation must provide a clear description of the approach chosen and the monitoring plan must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of the improved technology, whether the existing baseline technology is not surrendered at the time of the introduction of the improved technology, or whether a new baseline technology is acquired and put to use by targeted end users during the project crediting period. The success of the mechanism put into place must therefore be monitored, and the approach must be adjusted if proven unsuccessful. If an old technology remains in use in parallel with the improved technology, corresponding emissions must of course be accounted for as part of the project emissions.
    a. The technology used will displace GHG emissions from the use of fuel to boil water but will not replace the cook stoves which will still be used for cooking purposes. The fuel used to boil water will be monitored and the emissions arising from this activity will be included in the emissions reductions calculations as described in section B.6.1.

4. The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. This must be communicated to the technology producers and the retailers of the improved technology or the renewable fuel in use in the project situation by contract or clear written assertions in the transaction paperwork, If the claimants are not the project technology end users, the end users should be notified that they cannot claim for emission reductions from the project.
    a. PP clearly communicated to the stakeholders that PP will claim ownership rights at the stakeholder consultation. In addition, PP is including a document in every water filter sold that explains that PP retains the rights of ownership of the GHG reductions.

5. Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules. If the biomass feedstock is sourced from a dedicated

[20] Aprovecho Research Center (2007) *Laboratory Testing of Rocket Stoves of Various Capacities as Compared to the Three Stone Fire*. Graph titled *Firepower, Various Stove Capacities* Pg. 5. [Online] Available from: www.aprovecho.org/**lab**/pubs/rl/emissions-eval/doc/71/raw [Last Accessed 28th November 2011].

plantation, these criteria must apply to both plantations established for the project activity AND existing plantations that were established in the context of other activities but will supply biomass feedstock.

a. The technology does not make use of any fuel and therefore this condition does not apply to this project.

Furthermore, the following conditions apply:

a. Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases emitted by the project fuel/stove combination are estimated with adequate precision. The project fuel/stove combination may include instances in which the project stove is a baseline stove.
    a. The technology does not produce any GHG emissions therefore IAP are not worsened and no GHG arise from the use of the technology.
b. Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section II of this methodology if correlated to data on distribution and results of field tests and surveys confirming (a) actual use of the renewable fuel and usage patterns such as average fraction of non-renewable fuels used in mixed combustion or seasonal variation of fuel types, (b) GHG emissions, (c) evidence of CO levels not deteriorating (d) any further factors effecting emission reductions significantly.
    a. The technology does not produce any GHG emissions therefore IAP are not worsened and no GHG arise from the use of the technology.

B.3. Project boundary

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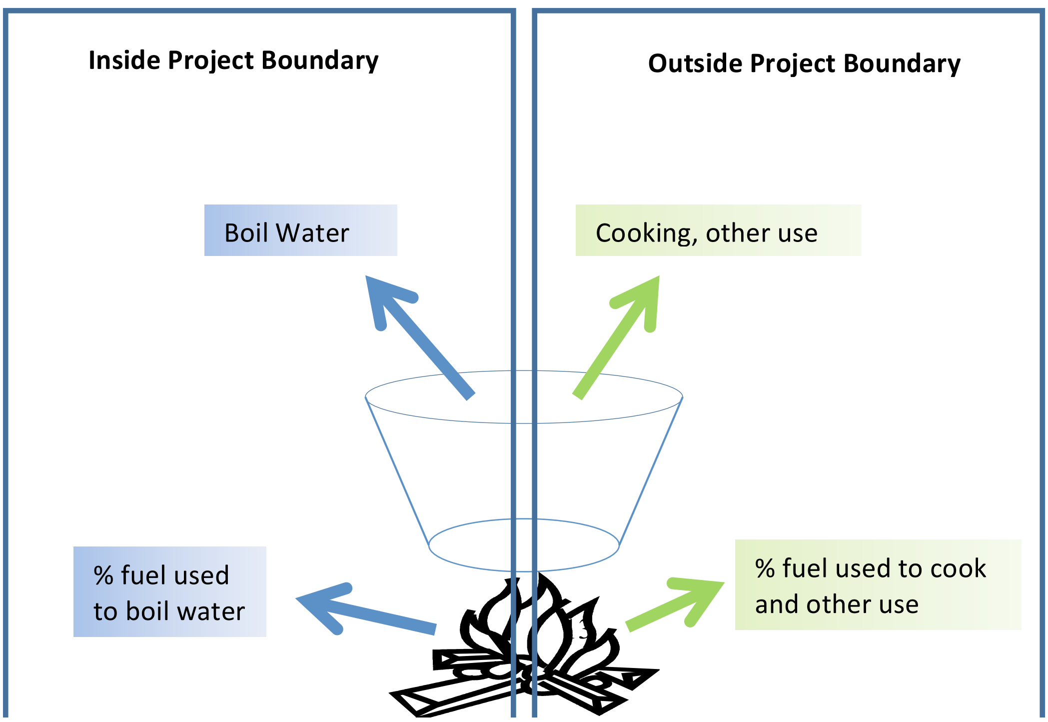
The project reduces the amount of greenhouse gases (GHGs) emitted through the use of fuel wood, by introducing widespread use of zero emission water treatment technology which replaces existing inefficient stoves. To ensure conservative estimates on emission reductions, the project will not account for GHG reductions attributable to production and transportation.

a. The project boundary is the physical, geographical sites of the project technologies and potentially of the baseline and project fuel collection and production (e.g. charcoal, plant oil), as well as solid waste and effluents disposal or treatment facilities associated with fuel processing.
    i. The project boundary is delimited by the % of biomass fuel used to boil water and is illustrated in the figure below:



b. The target area is defined by the regions or towns within a single country, or across multiple adjacent countries, where the considered baseline scenario(s) is (are) assessed to be uniform across political borders. The target area provides an outer limit to the project boundary in which the project has a target population.

b. The target area is extended to the entire country of the Kingdom of Cambodia as illustrated in the figure below:

c. In cases where woody biomass (including charcoal) is the baseline fuel, the fuel production and collection area is the area within which this woody biomass can reasonably be expected to be produced, collected and supplied. In case the project activity introduces the use of a new biomass feedstock in the project situation, the fuel production and collection area is the area within which the biomass is produced, collected and supplied.

c. Woody biomass is used in the baseline as a fuel to boil the water, however for conservativeness, PP will not include the emission arising from the transportation and production of baseline fuels.

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Heat delivery from the stoves to boil the water occurs	CO_2	Yes	Important source of emissions
		CH_4	Yes	Important source of emissions
		N_2O	Yes	Important source of emissions
	Production of fuel	CO_2	No	Not accounted for conservativeness
		CH_4	No	Not accounted for conservativeness
		N_2O	No	Not accounted for conservativeness
	Transport for fuel	CO_2	No	Not accounted for conservativeness
		CH_4	No	Not accounted for conservativeness
		N_2O	No	Not accounted for conservativeness
Project scenario	Heat delivery from the stoves to boil the water occurs	CO_2	Yes	Important source of emissions
		CH_4	Yes	Important source of emissions
		N_2O	Yes	Important source of emissions
	Production of fuel	CO_2	No	Not accounted for conservativeness
		CH_4	No	Not accounted for conservativeness
		N_2O	No	Not accounted for conservativeness
	Transport of fuel	CO_2	No	Not accounted for conservativeness
		CH_4	No	Not accounted for conservativeness
		N_2O	No	Not accounted for conservativeness

B.4. Establishment and description of baseline scenario

>>

In Cambodia, based on the demographic and health survey (2014), 35 % and 16% of households do not have access to improved drinking water sources in dry and rainy season respectively. Surface water in Cambodia is often plentiful but generally of poor quality, due in part to inadequate or nonexistent sanitation in rural areas. This leads to diarrhea and other water-borne diseases.

As described in Annex 3 of the methodology, the baseline scenario is the existing kitchen practice of treating water for drinking by boiling it on stoves using high emission fuels including non-renewable biomass and fossil fuels such as LPG, Kerosene.

In order to account for suppressed demand for water services in Cambodia, where there is not a satisfactory level of service in terms of treated water available for consumption in the baseline, inhibited by insufficient energy, income or infrastructure to meet basic water treatment needs, the baseline is the total amount of treated water for consumption per person per day in the project scenario. The water consumption field test conducted in 2016 shows that water consumption per person is 1.632 litres per day and each household has on average 5.13 people[21].

Fixed baseline

The CWP units will be continually distributed from the start of the project period and the baseline will remain unchanged during the crediting period, thus a fixed baseline will be applied.

The project proponent will only claim emission reductions for residents who are currently using unsafe water and currently boil or would boil their water if barriers were reduced, in the baseline.

[21] Hydrologic, Nexus (2016), *WCFT, Water Consumption field test*. Pg. 4.

Based on GS methodology TPDDTEC version 3.0, to estimate emission reduction, it is necessary to determine Cj and Xboil factor which will be described as follow:

- *"Cj: Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use."*

In Cambodia, as in many developing countries with access and infrastructure problems, access to tap water is considered as "improved water" rather than "safe water". While at the plant level, urban and rural water utility enterprises are able use basic treatment processes to treat source water in order to Cambodian drinking water quality standard issued in 2004, the amount of investment in renovation and maintenance of piping systems is low or lacking. Seeing numerous leakages and the state of drainage or sewerage networks, it's a general belief that water gets contaminated along the way to end users. People tend to consider the water from this system are not safe enough to drink directly because of the conditions of the distribution system (pipes). Based on the updated baseline survey conducted in 2017, majority of survey households (95.81%[22]) who has access to piped water supply have been treating or would have treated their water before drinking. Another study conducted by Chea (2015)[23] found that 97.98% of households that have access to piped water treat their water before drinking. This is a strong indication that the piped water is not safe for drinking from the current users' viewpoint. Furthermore, Chea (2015) conducted water quality test by following WHO water quality standard (<1 CFU of E.Coli/100 ml) on 320 HHs that connected to water pipe system. It was reported that 175 HHs passed water quality test which is 54.68% (175HHs/320 HHs) (please refer to Chea(2015)_piped_water_quality_study, page 32).

Therefore, in the calculation of Cj, 54.68% of HHs that use piped water were included in the calculation. Thus, **C_j = 25.97%**[24].

- *"Xboil: Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity. These premises must be located in the project boundary. This parameter can be determined ex-ante using a survey. This parameter is to be applied for premises that are under suppressed demand situation."*

Based on the baseline survey and calculation sheet for Cj and Xboil, Xboil is estimated to be **5.75%** (see HSE_CP2_Cj&Xboil_20171023)

Project scenario

The project developer has identified one project scenario based on the results of the baseline report and secondary references.

[22] See HSE_CP2_BaselineReport20171002, table 30 and table 35(page 24 and pge 26), 95.81% = (84.5+7)/95.5

[23] Chea, E (2015), An Assessment of Urban Household Microbial Quality of Drinking Water at Point of Consumption, Royal University of Phnom Penh

[24] HSE_CP2_Cj&Xboil_20171023

As per the baseline report, the prevalence of household who treat water before drinking in Cambodia is 62.75% and a further 37.25% do not treat their drinking water. Among those who treat water, 92.00% treating their water by boiling before drinking.. Ex-ante, the main fuel used for boiling water is demonstrably non-renewable biomass of wood and charcoal (74.24%) and LPG fuels (20%). Agricultural waste (5%) and electricity are not accounted in emission reduction calculation due to its low percentage of users.

The baseline scenario in Cambodia is the demand for non-renewable biomass used to treat drinking water by boiling on 1) a range of rudimentary and inefficient cooking stoves and 2) improved cooking stoves. The table[25] below shows the simplified breakdown of fuel type against type of stove used

	Type of stoves				
Fuel type	**Improved stove**	**Traditional cook stove**	**LPG**	**Electricity**	**Total**
Wood	11.26%	56.93%	0.00%	0.00%	68.18%
Charcoal	0.87%	5.19%	0.00%	0.00%	6.06%
LPG	0.00%	0.00%	19.91%	0.00%	19.91%
Electricity	0.00%	0.00%	0.00%	0.87%	0.87%
Agri_Waste	0.87%	4.11%	0.00%	0.00%	4.98%
Total	12.99%	66.23%	19.91%	0.87%	100.00%

Ex-ante, these ratios are conservative and are assumed to be constant over 7 years crediting i.e. no significant changes are expected in the first 7 years. This will be monitored and adjusted according to baseline kitchen survey and monitoring kitchen survey results.

GHG Emissions During Fuel Production

Fuel included in the baseline calculation is mainly biomass (74.24%), therefore, GHG emissions during the production of fuels are not considered. This is because of the difficulty and likely inaccuracies in calculation of production and transportation emissions. Additionally, GHG emissions due to fuel transportation are not considered to maintain conservativeness. Furthermore, in large part these emissions would occur regardless of the project activity.

Treated Water for Consumption ($Q_{p,y}$)

As described in Annex 3 of the methodology, this parameter is the amount of treated water for consumption per person per day in the project scenario p and supplied by project technology. Since this is a revised PDD for renewal of crediting period (CP2), this parameter was measured in the water consumption field test in 2016 under the 5th verification. It was estimated to be 1.63 lppd which is well below the capped value at 7.5 lppd. Thus, it is used in this document.

This situation clearly shows suppressed demand for safe water in Cambodia, due to infrastructure and poverty constraints, as 1.63 lppd is well below WHO recommendation of above 4.5 litres of water per person per day in hot tropical environments with manual labour[26].

[25] HSE_CP2_BaselineStove_FuelMix_Simplification_20171002, Tab, Final table ER Calc.

Cambodia has one of the poorest populations and infrastructure in the South East Asian region, has a tropical climate and high rates of manual labour. The consequences are serious: dehydration is the adverse consequence of inadequate water intake. The symptoms of acute dehydration vary with the degree of water deficit. For example, fluid loss at 1% of body weight impairs thermoregulation and, thirst occurs at this level of dehydration. Thirst increases at 2%, with dry mouth appearing at approximately 3%. Vague discomfort and loss of appetite appear at 2% and at 4% decrements of 20-30% is seen in work capacity. Difficulty concentrating, headache, and sleepiness are observed at 5%. Tingling and numbness of extremities can be seen at 6%, and collapse can occur at around 7% dehydration. A 10% loss of body water through dehydration is life-threatening.

Minimum requirements for an individual of 70kg in a tropical zone, such as Cambodia, are 4.1 to 6L/day (WHO 2005). **For manual labor in high temperatures the WHO estimates requirements of at least 4.5L for both men and women. Recommendations for children were calculated using 1 liter per day for a 10 kg child and 0.75 liter for a 5 kg child, which resulted in 1.0L/day under average conditions and 4.5L for manual labor in high temperatures.**

Non-Renewable Biomass

Based on the latest available information from the CDM-SSCWG43-A04, the default value of F_{NRB} for Cambodia is 77.00%[27]. Thus, PP uses this value in its emission reduction calculation.

Fraction of population boiling or that would boil in the baseline

The project proponent will only claim emission reductions for residents who currently boil, or would boil their water if barriers were reduced, in the baseline.

As per the baseline report, the prevalence of water boiling for treating drinking water in households in Cambodia is 57.75% and households that don't treat water at all before boiling is 37.25%, while the remaining 5% used other type of technology including other water filter and chemical tablet for treating water..

Water boiling expresses suppressed demand in the baseline. This is because almost 40% of the population have not heard any messages from the government or NGOs about clean water[28] and appropriate water treatment practices and 26% of HH do not treat drinking water at all. This situation shows suppressed demand because those who should have boiled water as a method of treatment do not do so, because of constraints of infrastructure and poverty (including access to information, time and fuel requirements). It is highly probable, considering the health benefits of water boiling, that given sufficient time, knowledge and finance, they would boil water as a treatment method.

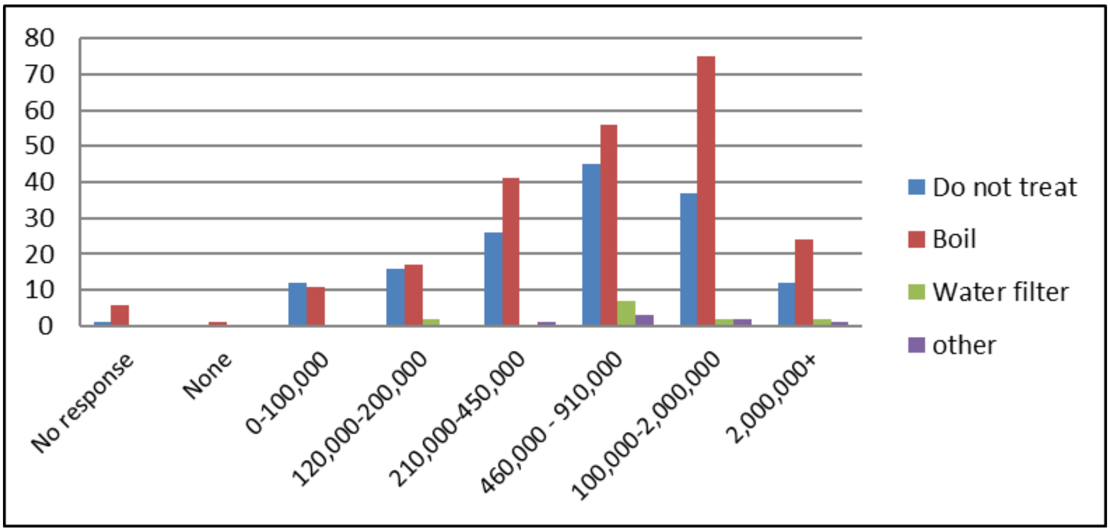
[26] WHO (World Health Organization) (2005) *Nutrients in Drinking Water. Water Sanitation and Health Protection and the Human Environment.* Pg. 34. [Online] Available from: http://www.who.int/water_sanitation_health/dwq/nutrientsindw.pdf [Last Accessed 28th November 2011].

[27] CDM-SSCWG43-A04 (Information Note-Default values of fraction of non-renewable biomass for Cambodia, version 01.0)
CDM-EB-77 (Meeting report CDM Executive Board seventy-seventh meeting, version 01.0) Para 58, page 14).

[28] PATH & IMS (2010) *Accelerating Trial and Adoption of POU HWTS Among the Middle to Low Income Population. Market Research Report Cambodia*. Pg. 68.

Based on the baseline survey, In baseline study, among 37.25% of households who do not treat water for drinking were asked if they will treat water for drinking or not if they have a proper resources, 62.42% of respondents said yes, they will. This shows clearly that there is a suppressed demand for treating water.

The baseline study clearly shows a correlation between water purification and income level. Indicating that, as incomes level rise, those presently not boiling water would be expected to do so. Indeed, the higher the income, the higher the proportion of households using a water treatment method. The average income of households who boil water is 0.8 times higher than the average income of households without treatment method. If these households were wealthier, the technique they will use at first is boiling water, because this is the most widespread and does not need any other material as a stove, which they are using for cooking: There is “suppressed demand” for boiling, meaning they would have used this method if they were wealthier, so they are part of the baseline. The graph and table below show the correlation between income and technique used to drink clean water.



Income	Do not treat	Boil	Water filter	other	Total
No response	1	6	0	0	7
None	0	1	0	0	1
0-100,000	12	11	0	0	23
120,000-200,000	16	17	2	0	35
210,000-450,000	26	41		1	68
460,000 - 910,000	45	56	7	3	111
100,000-2,000,000	37	75	2	2	116
2,000,000+	12	24	2	1	39
Total	149	231	13	7	400
Percentage	37.25%	57.75%	3.25%	1.75%	100%

An estimated 37.25% of residents have no water treatment method. Among them 46.98% said they will treat water by boiling before drinking. Assuming that these groups would have boiled water (i.e. the demand for water boiling is suppressed due to lack of infrastructure and poverty, and information on the importance of water treatment) the rate of water boiling in the baseline is assumed to be 75.25% (17.5%+ 57.75%).

Baseline Performance Field Test

In order to complete the Baseline Performance Field Test, 2 sets of data are needed:
- Fuel mix/ stove mix in use (Baseline Survey)
- Wood fuel needed to boil one litre of water for 10 minutes (Water Boiling Test)

The Baseline Survey[29] (first set of data) has used a representative sample of end users of 400 HH surveyed as per the methodology on section 7 page 12. The results as illustrated in the table below shows the percentage of different types of stoves and fuel usage by the households in Cambodia. Out of 400 HH surveyed, 231 provided valid data for type of stove and fuel usage. The below table shows a simplification of the baseline survey results for stove and fuel mix[30].

	Type of stoves				
Fuel type	**Improved stove**	**Traditional cook stove**	**LPG**	**Electricity**	**Total**
Wood	11.26%	56.93%	0.00%	0.00%	68.18%
Charcoal	0.87%	5.19%	0.00%	0.00%	6.06%
LPG	0.00%	0.00%	19.91%	0.00%	19.91%
Electricity	0.00%	0.00%	0.00%	0.87%	0.87%
Agri_Waste	0.87%	4.11%	0.00%	0.00%	4.98%
Total	12.99%	66.23%	19.91%	0.87%	100.00%

As per the methodology on section C. page 39: "The baseline water boiling test (BWBT) is conducted to calculate the quantity of fuel required to purify by boiling one litre of water for 10 minutes using technologies and fuels representative of the baseline scenario (Wb,y). The BWBT should be conducted using the 90/30 rule for selection of samples, accounting for variability in the types of prevalent baseline technologies."

At the time of first registration, the Water Boiling Test to assess the amount of wood fuel needed to boil one litre of water for 10 minutes was estimated using literature review as per the report from MacCarty (2010)[31]. This was only used as an estimate, the Water Boiling Test (Baseline Field Test) in the field was completed before the first verification as per the methodology on Annex 5 page 49. Because a design change has been requested after the 2nd verification, the project has now applied the actual values for the amount of fuel needed to boil one litre for 10 minutes from the BWBT completed prior to first verification.[32]

[29] Angkor Research and Consulting (2017)*"Baseline Survey Report on Ceramic Water Purifier by Hydrologic in the Kingdom of Cambodia"*
[30] HSECP2_Baseline Stove-Fuel Mix Simplificaiton_20170921_HH_VB
[31] MacCarty, N., et al. (2010) "Fuel use and emissions performance of fifty cooking stoves in the laboratory and related benchmarks of performance", Aprovecho Research Center, Energy for Sustainable Development, The Journal of the International Energy Initiative, Volume 14, Number 3, September 2010, p. 170, Table 1
[32] Hydrologic Social Enterprise (2012) Annex IV – WBT, Water Boiling Test Result

For this renewal crediting period, the data from water boiling test conducting before the first verification period is also applicable because the same type of fuel and stove are used. However, for LPG stove there was no any data from previous water boiling test. So, PP has opted to use formula presented in AMS III.AV version 5.0 to estimate the specific energy consumption required to boil one litre of water and then calculate the quantity of LPG (in tonnes) required to treat one litre of water (see the detail calculation at HSE_CP2_ER_Cal_20171023).

The quantity of LPG (in tonnes) required to treat one litre of water = SEC/[NCV_LPG*Conversion factor (TJ to kJ)] (1)

Where:

- SEC: Specific energy consumption required to boil one litre of water by using LPG stove = To be determined
- NCV_LPG: net calorific value of LPG = 0.047 TJ/tonne (IPCC (2006) "IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 1, Introduction, Table 1.2, p 1.18)
- Conversion factor TJ to kJ = 1000,000,000

Based on CDM methodology AMS III.AV Version 5, SEC can be calculated as following:

$$SEC = \left[WH \times \left(T_f - T_i\right) + 0.01 \times WHE\right] / n_{wb} \qquad (2)$$

Where:

- WH: Specific heat of water (kJ/L^{o}C), default value of 4.186 kJ/L ^{o}C
- Tf: Final temperature (^{o}C). Use a default value of 100 ^{o}C
- Ti: Initial temperature (^{o}C). Use a default value of 20 ^{o}C
- WHE latent heat of water evaporation. Use a default value of 2260kJ/L.
- η_{wb}, LPG: Efficiency of the water boiling systems being replaced. In case of LPG, the default value is 0.5.

By substituting all the known parameter into equation (2)
SEC =[4.186*(100 – 20)+ 0.01*2260]/0.5 = 714.96 kJ/L

Substituting SEC into equation (1)
The quantity of LPG (in tonnes) required to treat one litre of water = 714.96/(0.047*10^9)
The quantity of LPG required to treat one litre of water = 0.000015 tonne.

Since in the baseline scenario only 19.91% of HH using LPG stove to boil water, the quantity of LPG required to treat one litre of water under baseline scenario would be 0.0000030 tonne (0.000015*19.91%).

B.5. Demonstration of additionality

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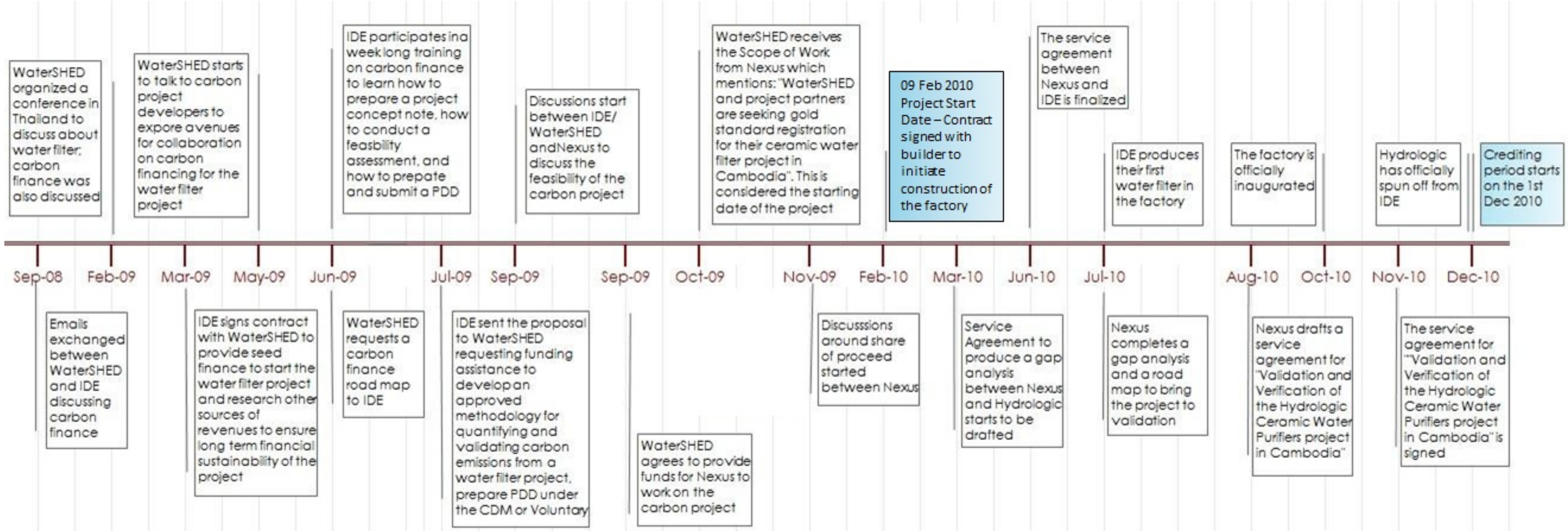
Summary:

Emissions reduction stem from energy use displacement for water boiling. Displacement of fuel is measured through an assumption of water boiling displacement (litres/hh/day), derived from baseline data and project monitoring and controlled tests. The fuel previously used for boiling water is displaced with the project.

Carbon Finance has been seriously considered for the project since well before the inception of the new production facility.

Below is the timeline of the key events from Sep 2008 (when the first emails were exchanged showing interest in carbon finance) until Dec 2010 (when the crediting period starts).

However, this project has been gone through five verification periods and it is going to renew its crediting period for the 2nd crediting period.


WaterSHED organized a conference in Thailand to discuss about water filter; carbon finance was also discussed
WaterSHED starts to talk to carbon project developers to expore avenues for collaboration on carbon financing for the water filter project
IDE participates in a week long training on carbon finance to learn how to prepare a project concept note, how to conduct a feasbility assessment, and how to prepate and submit a PDD
Discussions start between IDE/ WaterSHED andNexus to discuss the feasibility of the carbon project
WaterSHED receives the Scope of Work from Nexus which mentions: "WaterSHED and project partners are seeking gold standard registration for their ceramic water filter project in Cambodia". This is considered the starting date of the project
09 Feb 2010 Project Start Date – Contract signed with builder to initiate construction of the factory
The service agreement between Nexus and IDE is finalized
IDE produces their first water filter in the factory
The factory is officially inaugurated
Hydrologic has officially spun off from IDE
Crediting period starts on the 1st Dec 2010
Sep-08
Feb-09
Mar-09
May-09
Jun-09
Jul-09
Sep-09
Sep-09
Oct-09
Nov-09
Feb-10
Mar-10
Jun-10
Jul-10
Aug-10
Oct-10
Nov-10
Dec-10
Emails exchanged between WaterSHED and IDE discussing carbon finance
IDE signs contract with WaterSHED to provide seed finance to start the water filter project and research other sources of revenues to ensure long term financial sustainability of the project
WaterSHED requests a carbon finance road map to IDE
IDE sent the proposal to WaterSHED requesting funding assistance to develop an approved methodology for quantifying and validating carbon emissions from a water filter project, prepare PDD under the CDM or Voluntary
WaterSHED agrees to provide funds for Nexus to work on the carbon project
Discusssions around share of proceed started between Nexus
Service Agreement to produce a gap analysis between Nexus and Hydrologic starts to be drafted
Nexus completes a gap analysis and a road map to bring the project to validation
Nexus drafts a service agreement for "Validation and Verification of the Hydrologic Ceramic Water Purifiers project in Cambodia"
The service agreement for "Validation and Verification of the Hydrologic Ceramic Water Purifiers project in Cambodia" is signed

The CWP project is not financially viable on a range of temporal scales without carb
Prior to recent funding support from USAID, the project was actually planned to be d
funding has provided seed capital for the past 2 years (FY 2009-2010) that allowed H
from IDE, continue distributing water filters, and search for alternative sources of reve

The current assistance given to the project by WaterSHED (USAID) and PATH
operations as well as establishing the new production facility.

Current assistance, grant revenue, to the project is 42% of total revenue in Financial
Financial Year (FY) 2010 it is 64% of the total revenue and 54% if Financial Y
current funding will end in FY 2011.

Future funding will be based on Carbon finance to replace external grant funding. Th
of emissions reductions credits will be critical to Hydrologic becoming an or
enterprise capable of providing emissions-free household water treatment options t
The proposed activity, undertaken without being registered as a VGS carbon financ
be viable.

The project will use carbon finance to directly and indirectly subsidize the costs of
user, through investment in quality control and dissemination in remote areas, p
research and development and marketing.

Without carbon finance, the price of units would be much higher, fewer units wo
would be limited in rural areas, and only households with sufficient disposable incor
access CWPs.

Additionality assessment using UNFCCC tool for additionality:

Additionality for the project activity is demonstrated using the Annex 03 Methodolog
tool to identify the baseline scenario and demonstrate additionality" (Version 07.0) ar
additionality as per the Gold Standard methodology "Technologies and Pra
Decentralized Thermal Energy Consumption – July 2015" on page 9.

Step 0. Demonstration that a proposed project activity is the first-of-it-kind

The prevailing practices in Cambodia for water treatment have been extensively sur
report shows that 57.75% of people boil water and an additional 37.25% does not tr
remaining 5% of the population use other types of water treatment including oth
chemical treatments. Furthermore, the Cambodia health survey (2014) reported th
Cambodian households use water purifier including ceramic, sand or other filter to
water.

Thus, the project can be described as **"the first-of-its-kind"** project as less than 20
currently use ceramic water filters and the most common method is boiling water.
Gold Standard additionality assessment which states that if "the project technology h
less than 20% of the population in the target area, the technology can be qualified as "
hence a realistic and credible barrier due to prevailing practice can be claimed."

Step 1: Identification of alternative Scenarios

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

Scenarios	Alternative
S1	The proposed project activity without carbon finance
S2	Energy for boiling water delivered at household level through the use of fossil fuels or electricity
S3	No action is taken, continuation of the current situation by drinking untreated water
S4	No action is taken, continuation of the current situation by boiling water as treatment method to treat water
S5	An alternative point-of-use water treatment system using renewable energy
S6	Not applicable

Sub-step 1b: Consistency with mandatory laws and regulations:
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 Ministers[33], defining the standards of safe drinking water in line with the WHO guidance, and the National Policy on Water Supply and Sanitation[34] 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.

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.

[33] WEPA (Water Environment Partnership in Asia) (2004) *Drinking Water Standard*. [Online] Available from: http://www.wepadb.net/policies/law/cambodia/07.htm [Last Accessed 28th November 2011].
[34] 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 [Last Accessed 28th November 2011].

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 CWP in Cambodia.

Step 2: Barrier analysis

Step 2a: Identify barriers that would prevent the implementation of alternative scenarios

(a) Investment barriers, other than insufficient financial returns, inter alia:
- Not available.

(b) Technical barriers, inter alia:
- Skilled and/or properly trained labour to operate and maintain the technology is not available in the applicable geographical area.
- Lack of infrastructure for implementation and logistics for maintenance of the technology

List of Barriers that may prevent one or more alternative scenarios to occur	
Investment barriers	NA
Technical barriers	Skilled and/or properly trained labour to operate and maintain the technology is not available in the applicable geographical area
	Lack of infrastructure for implementation and logistics for maintenance of the technology

Step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

The following table show how the barrier prevent alternatives from being implemented

Scenarios	Alternative		Justification and evidence
S1	The proposed project activity without carbon finance	- Skilled and/or properly trained labour to operate and maintain the technology is not available in the applicable geographical area - Lack of infrastructure for	No technical barrier
S2	Energy for boiling water delivered at household level through the use of fossil fuels or electricity.		Cambodia is not a fossil fuels producer country. Every year, Cambodia import different type of petroleum products[35] including diesel oil, gasoline LPG…etc. Furthermore, electricity in Cambodia is generated from hydropower, coal, diesel/HFO plants and

[35] Cambodia National Energy Statistic 2016, http://www.eria.org/publications/key_reports/FY2015/No.8.html

		implementation and logistics for maintenance of the technology	imported electricity. By mid-2015, only 62%[36] of villages were connected to the grid and the average price per kWh vary between 0.15 to 0.25 USD[37]. As a result, the option of using fossil fuel or electricity to boil water is not favourable due to the lack of infrastructure and high electricity tariff.
S3	No action is taken, continuation of the current situation by drinking untreated water		No barrier
S4	No action is taken, continuation of the current situation by boiling water as treatment method to treat water		
S5	An alternative point-of-use water treatment system using renewable energy		The development of renewable energy sector in Cambodia is very minimal, less than 1%[38] if large-scale hydropower (>10MW) was excluded. Thus, using renewable energy to treat water may not be feasible due to lack of infrastructure.
S6	Not applicable		

After analysing each alternative scenario with the barriers, three alternatives (S1, S3 and S4) are remained to be considered. However, it should be noted that there is a suppressed demand to treat water for drinking, once a proper resource would be available. Thus, activity S3 would be transformed into activity S4. As a result, two alternative scenarios are remained.

No	List of alternative scenarios to the project activity that are not prevented by any barrier	Justification
S1	The proposed project activity without carbon finance	
S4	No action is taken, continuation of the current situation by boiling or using water filer water as treatment method to treat water.	These two alternatives are not subject to investment or prevailing technical barriers as these options reflect business as usual

Since the proposed project type is the first-of-its-kind and only the proposed project that could provide product (Ceramic Water Purifier) and service to the market based on above analysis of each alternative scenario against barriers. Therefore, the project activity is additional.

[36] WWF report (2016), Power Sector Vision
[37] EAC (2015), yearly report on power sector: https://eac.gov.kh/en/publication/report/
[38] Poch, K. (2013), 'Renewable Energy Development in Cambodia: Status, Prospects and Policies', in Kimura, S., H. Phoumin and B. Jacobs (eds.), *Energy Market Integration in East Asia: Renewable Energy and its Deployment into the Power System*, ERIA Research Project Report 2012-26, Jakarta: ERIA. pp.227-266.

Step 3: Investment analysis
Not used

B.6. Emission reductions
B.6.1. Explanation of methodological choices
>>
Emission Reductions
Quantities of fuel consumed in the baseline and project scenarios, $B_{b,y}$ and $B_{p,y}$, respectively, are calculated as shown below. Fuel consumption is calculated (or "back-calculated" in the case of the baseline scenario) by multiplying the safe water consumption of end users observed in the project scenario by the amount of fuel required to boil a specific quantity of water (typically measured as volume per person per day).

Baseline Scenario Fuel Consumption Calculations

$B_{b,y}$ = Number of person-days * Baseline Fuel used to Treat Water (T/L) * Total Safe Water consumed in project scenario (L/p/d)

$B_{b,y} = (1-X_{boil})*(1-C_j) * N_{j,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$

Where:

X_{boil} Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity. These premised must be located in the project boundary. This parameter can be determined ex-ante using a survey. This parameter is to be applied for premised that are under suppressed demand situation.

$N_{j,y}$ Number of person.days consuming water supplied by project scenario p through year y

C_j Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premised with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cased eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premised do actually boil water or would indeed have boiled water to make it safe for use.

$Q_{p,y}$ Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day

$Q_{p,rawboil,y}$ Quantity of raw water boiled in the project scenario p per person per day

$W_{b,y}$ Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test

Project Scenario Fuel Consumption Calculation

$B_{p,j}$ = Number of person.days * Project Fuel used to boil water (T/L) * Total volume of water boiled in project scenario (L/p/d)

$B_{p,y} = (1-C_j) * N_{p,y} * W_{p,y} * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$

Where:

$N_{p,y}$	Number of person.days consuming water supplied by project scenario p through year y
C_j	Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premised with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cased eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premised do actually boil water or would indeed have boiled water to make it safe for use.
$B_{p,y}$	Quantity of fuel consumed in project scenario p during the year y in tons
$Q_{p,rawboil,y}$	Quantity of raw water boiled in the project scenario p per person per day
$Q_{p,cleanboil,y}$	Quantity of safe water boiled in the project scenario p per person per day
$W_{p,y}$	Quantity of wood fuel or fossil fuel in tons required to treat 1 litre of water per day using technologies representative of the project scenario p during project year y

Emission Reductions

$BE_{b,y} = B_{b,y} * ((f_{NRB,b,y} * EF_{b,fuel,CO2}) + EF_{b,fuel,nonCO2}) * NCV_{b,fuel}$

$PE_{p,y} = B_{p,y} * ((f_{NRB,p,y} * EF_{p,fuel,CO2}) + EF_{p,fuelnonCO2}) * NCV_{p,fuel}$

Where:

$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO_2e
$B_{b,y}$	Quantity of fuel consumed in baseline scenario b during year y, in tons, as per by-default factors
$f_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{b,fuel}$	Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel,0.015TJ/ton)

$EF_{b,fuel,CO2}$ CO_2 emissions factor of the fuel that it substituted or reduced. 112 tCO_2/TJ for Wood/Wood waste, or the IPCC default value of the relevant fuel

$EF_{b,fuel,nonCO2}$ Non-CO_2 emissions factor of the fuel that is substituted or reduced

The overall GHG reductions are calculated as follows:

$ER_y = (\sum BE_{b,y} - \sum PE_{p,y}) * U_{p,y}$ * Water Quality_passing rate - $\sum LE_{p,y}$

Where:

$U_{p,y}$ Cumulative usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate

Water Quality_passing rate The rate of CWP that passed water quality test

The excel version of the calculations is available at request.

Treated water boiled ($Q_{p,rawboil,y}$), ($Q_{p,cleanboil,y}$)

The amount of treated water boiled and raw water boiled will be determined during monitoring surveys, when end-users will be asked if they currently boil water for consumption other than cooking. If yes, the volume of water boiled per family will be recorded using Field Consumption Test (FCT). This volume of treated, boiled water will be included with the project emission calculation.

Fraction of population adopting technology ($U_{p,y}$)

A priori, because the units are sold, it is assumed that all of the CWP units will be adopted and used in the same month, and used appropriately, according to the usage guidelines from the manufacturer, by the recipients. The commercial supply chain of Ceramic Water Purifiers ensures that units are used by end users:

- Users pay a price to purchase a Ceramic Water Purifier, which ensures that the product is of value to the buyer and will be used. Usage rates are monitored and verifiable through the Field Survey.
- For retail sales, retailers also operate as small businesses. They must invest capital to purchase the Ceramic Water Purifiers. To recover their investment retailers must ensure that users purchase their filters. For the purposes of the baseline a lag time of one month between retailer purchase and end user purchase has been assumed. To account for this, credits will only begin to be claimed in the month following the month of sale for all CWPs.

The project proponent will adjust emission reduction claims based on estimated baseline and subsequent actual survey results for adoption rate.

Due to the request for design change after the 2nd verification, the project proponent has estimated usage in the excel file of emission reduction calculations over time using values from the usage survey in the 2nd monitoring period, and, for a conservative estimate, has assumed that units are out of use by the sixth year. This is only for estimation purposes, as actual usage surveys will determine when units are no longer in use.

For this renewal crediting period, PP has estimated usage rate in the excel file of emission reduction calculations over time by using usage rate value from the 5th verification. For a conservative estimation, it is assumed that units are out of used by the fifth year.

As advised in the methodology, the PP will use a weighted usage rate. Because the calculations here are for one unit in use, the PP has applied a usage rate of 1.0.

Therefore, for the baseline for one unit of CWP, the usage rate is assigned to be 1.0 ($U_{p,y}$ for one active unit of CWPs)

As $U_{p.y}$ is assumed to change over time, for detailed estimates of $U_{p,y}$ over the crediting period, see the Emission Reduction calculation excel file.

Leakage (L_y)

The project proponent has investigated the following potential sources of leakage:

a) *The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.*
There will be no displaced baseline technology as households will continue to cook using the cook stoves they own. Therefore, there will be no leakage impact to consider for this point.

b) The non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.
The volume of water treated by boiling in the baseline consumes a fractional portion of the biomass used by families. Biomass is currently non-renewable and expensive for families. It is highly unlikely that any biomass saved by the project activity will significantly reduce biomass costs outside the project boundary. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

c) The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario
The small size of the project is unlikely to have a significant impact on the NRB fraction. Therefore, the leakage arising from significantly impacting NRB is considered null.

d) The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.
In Cambodia households rarely, if ever, use stoves for heating as the temperature is rarely under 20C all year long. Therefore, it is unlikely that the project activity will result in increased use of biomass for space heating effects. Thus, the project proponent assigns a value of 0 to this leakage parameter.

e) By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within households who commonly used technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.
This leakage parameter is not applicable in this project, where the activity is provisioning of a water treatment system. The project proponent will not be involved in promoting any particular stove or fuel type. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

f) Other sources of leakage:
- *The project activity will need firewood to fuel the kilns to fire the ceramic pots. PP is accounting for the emissions coming from those activities by measuring the quantity of wood purchased*

during the project activities and measuring the GHG emissions arising from burning the wood. The calculations are available in the excel spreadsheet and original receipts are available at DOE's request.

$L_{p.y} = Q_{wood.m3.p.y} * C_{content} * R_{ratio} * f_{NRB,p.y} * P_{unit.p.y}$

Where:

$Q_{wood.m3.p,y}$ Quantity of wood used in m3[39]

$C_{content}$ Carbon content in wood[40]

R_{ratio} Ratio CO2/C[41]

$F_{NRB,y}$ fNRB[42]

$P_{unit.p.y}$ Number of CWP units per year[43]

B.6.2. Data and parameters fixed ex ante
(Copy this table for each piece of data and parameter.)

Data / Parameter	$F_{nrb,bl,y}$
Unit	Fraction
Description	Non-renewability of woody biomass fuel in year y in baseline scenario
Source of data	CDM-SSCWG43-A04 (Information Note-Default values of fraction of non-renewable biomass for Cambodia, version 01.0). CDM-EB-77 (Meeting report CDM Executive Board seventy-seventh meeting, version 01.0) Para 58, page 14).
Value(s) applied	0.77
Choice of data or Measurement methods and procedures	Reference section B.6.1, Non-Renewable Biomass.
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

[39] The quantity of wood in m3 will be monitored throughout the crediting period
[40] IPCC (2006) "IPCC Guidelines for National Greenhouse Gas Inventories", Chapter 12, Harvested Wood Products, Table 12.4, p.12.19
[41] EPA (2011) "Clean Energy, Calculations and References, Therms of Natural Gas" available at http://www.epa.gov/cleanenergy/energy-resources/refs.html
[42] fNRB is available in section B4 of this PDD
[43] The number of units produced per year will be monitored throughout the crediting period

Data / Parameter	C_j
Unit	Fraction
Description	Portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premised with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cased eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premised do actually boil water or would indeed have boiled water to make it safe for use.
Source of data	Baseline report and Cj & Xboil calculation sheet (Please refer HSE_CP2_Cj&Xboil_20171023).
Value(s) applied	25.97%
Choice of data or Measurement methods and procedures	Determined as per baseline report and Cj & Xboil calculation sheet
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$EF_{b,wood,CO2}$ / $EF_{p,wood,CO2}$
Unit	tCO2/TJ
Description	CO2 emission factor arising from use of fuels in baseline/project scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	112
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$
Unit	tCO2e/TJ
Description	Non-CO2 emission factor arising from use of fuels in baseline/project scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	8.69 ((CH4=0.3*GWP 25) + (N2O=0.004*GWP 298))
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$EF_{b,charcoal,CO2}$ / $EF_{p,charcoal,CO2}$
Unit	tCO2/TJ
Description	CO2 emission factor arising from use of fuels in baseline scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	112
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$EF_{b,charcoal,non-CO2}$ / $EF_{p,charcoal,non-CO2}$
Unit	tCO2e/TJ
Description	Non-CO2 emission factor arising from use of fuels in baseline scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	5.30 ((CH4=0.2*GWP 25) + (N2O=0.001*GWP 298))
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$EF_{b,LPG,CO2}$ / $EF_{p,LPG,CO2}$
Unit	tCO2/TJ
Description	CO2 emission factor arising from use of fuels in baseline scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	63.10
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$EF_{b,LPG,non\text{-}CO2}$ / $EF_{p,LPG,non\text{-}CO2}$
Unit	tCO2e/TJ
Description	Non-CO2 emission factor arising from use of fuels in baseline scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	0.1548 ((CH4=0.005*GWP 25) + (N2O=0.0001*GWP 298))
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures, it is small and it is negligible in the ER calculation.
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$NCV_{b,wood}$ / $NCV_{p,wood}$
Unit	TJ/ton
Description	Net calorific value of the fuels used in baseline/ project scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$NCV_{b,charcoal}$ / $NCV_{p,charcoal}$
Unit	TJ/ton
Description	Net calorific value of the fuels used in baseline/ project scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	0.0295
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$NCV_{b,LPG}$ / $NCV_{p,LPG}$
Unit	TJ/ton
Description	Net calorific value of the fuels used in baseline/ project scenario
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	0.047
Choice of data or Measurement methods and procedures	Determined as per IPCC default figures
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data and parameters not monitored over the crediting period:

Data / Parameter	C_j
Unit	Percentage
Description	Portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premised with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cased eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premised do actually boil water or would indeed have boiled water to make it safe for use.
Source of data	Baseline study.
Value(s) applied	The data comes from the baseline study and will not be monitored
Choice of data or Measurement methods and procedures	The data is analysed in the baseline report and raw data is available on request to the DOE
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	X_{boil}
Unit	Percentage
Description	Percentage of premises that in the absence of the project activity would have used non-GHG emitting technologies like chlorine treatment techniques (if available) in the project boundary.
Source of data	Survey
Value(s) applied	Baseline only; should be updated if ongoing monitoring surveys show that baseline water boiling change over time.
Choice of data or Measurement methods and procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$W_{b,y}$
Unit	Kg/litre
Description	Quantity of wood fuel or fossil fuel required to boil 1 litre of water using technologies representative of baseline scenario b during project year y
Source of data	Baseline Water Boiling Test. The results from water boiling test conducted in 2012 is used because there is not any significant change in terms of stove
Value(s) applied	Baseline only; should be updated if ongoing monitoring surveys show that baseline water boiling change over time.
Choice of data or Measurement methods and procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$W_{p,y}$
Unit	Kg/litre
Description	Quantity of wood fuel or fossil fuel required to boil 1 litre of water using technologies representative of the project scenario p during project year y
Source of data	Project water boiling test following same procedure as BWBT
Value(s) applied	Should be updated whenever new water boiling technologies are introduced over time
Choice of data or Measurement methods and procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of project emissions
Additional comment	

B.6.3. Ex ante calculation of emission reductions
>>
The calculations below are based on 1 water filter for 1 household.

Baseline:
$B_{b,y}$ = Number of person-days * Baseline Fuel used to Treat Water (T/L) * Total Safe Water consumed in project scenario (L/p/d)

$B_{b,y} = (1-X_{boil})* (1 – C_j) * N_{j,y} * W_{b,y} * (Q_{j,y} + Q_{j,rawboil,y})$

$B_{b.y.wood} = (1- 0.0575)*(1- 0.2597) * (1HH*5.139*365) * 0.00016 * (1.63 + 1.554)$

$B_{b.y.wood} = 0.668$

$B_{b.y.charcoal} = (1-0.0575) * (1- 0.2597) * (1HH*5.139*365) * 0.000008 * (1.63 + 1.554)$

$B_{b.y.charcoal} = 0.033$

$B_{b.y.LPG}$ = (1-0.0575) * (1- 0.2597) * (1HH*5.139*365) * 0.000003 * (1.63 + 1.554)
$B_{b.y.LPG}$ = 0.013

Project Emissions
$B_{p,y} = (1-C_j) * N_{p,y} * W_{p,y} * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$

$B_{p.y.wood}$ = (1- 0.1388)* (1HH*5.139*365) * 0.00016 * (1.55 + 0.05)

$B_{p.y.wood}$ = 0.357

$B_{p.y.charcoal}$ = (1- 0.1388) *(1HH*5.139*365) * 0.000008 * (1.55 + 0.05)

$B_{p.y.charcoal}$ = 0.018

$B_{p.y.LPG}$ = (1- 0.1388) * (1HH*5.139*365) * 0.000003 * (1.55 + 0.05)

$B_{p.y.LPG}$ = 0.007

Emission Reductions

BEb,y,wood = Bb,y,wood * ((ʃNRB,b,y * EFb,wood,CO2) + EFb,wood,nonCO2) * NCVb,wood
$BE_{b.y.wood}$ = 0.668 * ((77.00% * 112) + 8.692) * 0.015
$BE_{b.y.wood}$ = 0.951

BEb,y,charcoal = Bb,y,charcoal * Wood to Charcoal factor * ((ʃNRB,b,y * EFb,wood,CO2) + EFb,wood,nonCO2) * NCVb,wood
$BE_{b.y.charcoal}$ = 0.033 * 6 * ((77.00% * 112) + 8.692) * 0.015
$BE_{b.y.charcoal}$ = 0.286

BEb,y,LPG = Bb,y,LPG * ((ʃff,b,y * EFb,LPG,CO2) + EFb,LPG,nonCO2) * NCVb,LPG
$BE_{b.y.LPG}$ = 0.013 * ((100.00% * 63.1) + 0) * 0.0473
$BE_{b.y.LPG}$ = 0.037

PEp,y,wood = Bp,y,wood * ((ʃNRB,p,y * EFp,wood,CO2) + EFp,wood,nonCO2) * NCVp,wood
$PE_{p.y.wood}$ = 0.357 * ((77.00% * 112) + 8.692) * 0.015
$PE_{p.y.wood}$ = 0.508

PEp,y,charcoal = Bp,y,charcoal *Wood to charcoal factor* ((ʃNRB,p,y * EFp,wood,CO2) + EFp,wood,nonCO2) * NCVp,wood
$PE_{p.y.charcoal}$ = 0.018* 6*((77.00% * 112) + 8.692)) * 0.015
$PE_{p.y.charcoal}$ = 0.153

PEp,y,LPG = Bp,y,LPG * ((ʃff,p,y * EFp,LPG,CO2) + EFp,LPG,nonCO2) * NCVp,LPG

$PE_{p.y.LPG}$ = 0.007 * ((100.00% * 63.1) + 0) * 0.0473
$PE_{p.y.LPG}$ = 0.020

Leakage calculation

$LE_{p.y} = Q_{wood.m3.p.y} * Q_{woodkg/m3} * C_{content} * R_{ratio} * f_{NRB,p.y} / P_{unit.p.y}$

$LE_{p.y}$ = 1094*289.72 * 0.50 * (44/12) * 77.00% / 45768

$LE_{p.y}$ = 0.010

The overall GHG reductions are calculated as follows:

$ER_y = (\sum BE_{b,y} - \sum PE_{p,y}) * U_{p,y}$ * Water quality passing rate - $\sum LE_{p,y}$

ER_y = (1.274 – 0.681) * 100% * 100% - 0.01

ER_y = 0.583t$CO2_e$ per water filter per year

The table below provides a summary of the calculations per CWP per year.

Description	Parameter	Value	Unit
Wood consumption	$B_{b,y,wood}$	*0.668*	*tonnes*
Charcoal consumption	$B_{b,y,charcoal}$	*0.033*	*tonnes*
Number of person.days supplied by CWP	$N_{j,y}$	*1,875.735*	*person.days*
People drinking safe water without boiling it	C_j	*25.97*	*%*
Quantity of safe water consumed	$Q_{p,y}$	*1.63*	*litres per person per day*
Quantity of raw water boiled	$Q_{p,rawboil,y}$	*1.55*	*litres per person per day*
Quantity of safe water boiled	$Q_{p,cleanboil,y}$	*0.050*	*Litre per person per day*
Wood required to boil 1 litre of water	$W_{b,y,wood}$	*0.00016*	*tonnes*
Charcoal required to boil 1 litre of water	$W_{b,y,charcoal}$	*0.000015*	*tonnes*
Quantity of wood consumed	$B_{p,y,wood}$	*0.357*	*tonnes*
Quantity of charcoal consumed	$B_{p,y,charcoal}$	*0.018*	*tonnes*
Number of person.days supplied by CWP	$N_{p,y}$	*1,875.745*	*person.days*
People drinking safe water without boiling it	C_j	*25.97*	*%*
Percentage of premises that would have used other non-GHG emitting technologies like Chlorine treatment techniques, if available, in the absence of project activities.	X_{boil}	*5.75*	*%*
Baseline emissions for wood	$BE_{b,y,wood}$	*0.951*	*tCO2e*
Project emissions for wood	$PE_{p,y,wood}$	*0.508*	*tCO2e*
Baseline emissions for charcoal	$BE_{b,y,charcoal}$	*0.286*	*tCO2e*
Project emissions for charcoal	$PE_{p,y,charcoal}$	*0.153*	*tCO2e*
Non Renewable Biomass	$f_{NRB,y}$	*77.00*	*%*
Net Calorific Value wood	$NCV_{b,wood}$	*0.015*	*TJ/ton*
CO2 Emission Factor wood	$EF_{b,wood,CO2}$	*112.00*	*tCO2*

CH4 and N2O Emission Factor for wood	$EF_{b,wood,nonCO2}$	*8.69*	*tonnes*
Net Calorific Value charcoal	$NCV_{b,charcoal}$	*0.030*	*TJ/ton*
CO2 Emission Factor charcoal	$EF_{b,charcoal,CO2}$	*112.00*	*tCO2*
CH4 and N2O Emission Factor for charcoal	$EF_{b,charcoal,nonCO2}$	*5.30*	*tonnes*
Baseline Emissions	$BE_{b,y}$	1.274	tCO2e
Project Emissions	$PE_{p,y}$	0.681	tCO2e
Usage rate for one active unit	$U_{p,y}$	100.00	%
Percentage of CWP passed water quality standard (WHO) for one active unit	Passed water quality rate	100	%
Leakage	$LE_{p,y}$	0.010	tCO2e
Emission Reductions per unit	$\mathbf{ER_y}$	**0.583**	**tCO2e**

The calculations are based on the equation presented in section B.6.1 and data presented above that is sourced from the baseline report, IPCC, assumptions on the sales volumes and other references. An excel sheet with all the calculations is available at request.

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Dec-17	25,768	13,773	198	7,527
2018	315,922	168,861	2,425	91,773
2019	290,565	155,308	2,230	83,659
2020	297,512	159,021	2,284	85,833
2021	292,108	156,133	2,242	84,427
2022	286,892	153,345	2,202	82,884
2023	284,625	152,133	2,185	82,228
Jan – Nov 2024	258,248	138,034	1,982	74,608
Total	2,051,640	1,096,607	15,748	592,939
Total number of crediting years	**7**			
Annual average over the crediting period	*293,091*	*156,658*	*2,250*	84,706

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored
(Copy this table for each piece of data and parameter.)

Data / Parameter	$Q_{p,y}$
Unit	Litres per person per day
Description	Quantity of safe water supplied in the project scenario p during the year y, using CWP
Source of data	Water Consumption Field Test (WCFT)
Value(s) applied	1.63
Measurement methods and procedures	The main purpose of the test is to determine the volume of water consumed per person per day in baseline and project scenarios. Hydrologic's Water Consumption Test has determined the litres of water consumed by measuring changes in the weight of water in buckets and the water filter containers using weighing scales. The test is conducted for four days at household that are currently using CWP. See Water Consumption Field Test report 2016.
Monitoring frequency	Before first verification and every two years.
QA/QC procedures	The data will be analyzed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of baseline
Additional comment	The value 1.63 of $Q_{p,y}$ was the data from the last WCFT conducted in 2016. It will be updated before 1st verification of CP2

Data / Parameter	$Q_{p,rawboil,y}$
Unit	Litres per person per day
Description	The raw or unsafe water that is still boiled after installation of the CWP
Source of data	Water Consumption Field Test
Value(s) applied	1.55
Measurement methods and procedures	The main purpose of the test is to determine the volume of water consumed per person per day in baseline and project scenarios. Hydrologic's Water Consumption Test has determined the litres of water consumed by measuring changes in the weight of water in buckets and the water filter containers using weighing scales. The test is conducted for four days at household that are currently using CWP. See Water consumption field test report 2016
Monitoring frequency	Before first verification and every two years
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE.
Purpose of data	Calculation of baseline and project emissions
Additional comment	The value 1.55 of $Q_{p.rawboil,y}$ was the data from the last WCFT conducted in 2016. It will be updated before 1st verification of CP2

Data / Parameter	$Q_{p,cleanboil,y}$
Unit	Litres per person per day
Description	Quantity of safe water (treated or from safe supply) water boiled in the project scenario p, after installation of the CWP
Source of data	Water Consumption Field Test
Value(s) applied	0.05
Measurement methods and procedures	The main purpose of the test is to determine the volume of water consumed per person per day in baseline and project scenarios. Hydrologic's Water Consumption Test has determined the litres of water consumed by measuring changes in the weight of water in buckets and the water filter containers using weighing scales. The test is conducted for four days at household that are currently using CWP. See Water Consumption Field Test report 2016.
Monitoring frequency	Before first verification and every two years.
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of project emissions
Additional comment	The value 0.05 of $Q_{p.cleanboil,y}$ was the data from the last WCFT conducted in 2016. It will be updated before 1st verification of CP2.

Data / Parameter	Quality of the water treated
Unit	As appropriate in alignment with QA/QC procedures
Description	Performance of the CWP-drinking water quality standard (WHO standard)
Source of data	Water quality test
Value(s) applied	0.8 (Average rate of water quality that pass the standard)
Measurement methods and procedures	Water quality test is conducted based on TPDDTEC version 3.0 (page 38) in which the sample size is following 90/10 precision rule. The water sample is taken at water outlet randomly from project database. Then, an accredited laboratory is used to conduct the water quality test.
Monitoring frequency	Quarterly
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE as described in section B.7.2.6
Purpose of data	Calculation of baseline and project emissions
Additional comment	The value 0.8 of water quality passing the standard is an assumed average rate. It will be updated during the 1st verification of CP2.

Data / Parameter	$U_{p,y}$
Unit	Percentage
Description	Usage rate in project scenario p during year y
Source of data	Annual usage survey
Value(s) applied	For ex-ante calculation of ER/unit in PDD and ER spreadsheet, PP has estimated a weighted usage rate for 7 years – see ER calculation excel file for details.
Measurement methods and procedures	Determined by annual usage survey
Monitoring frequency	Annual or more frequently, in all cases on time for any request for issuance.
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$N_{p,y}$
Unit	Person.days
Description	Number of persons consuming water supplied by project scenario p through year y
Source of data	Water Consumption Field Test
Value(s) applied	1,875.74 (per water filter per year)
Measurement methods and procedures	The number of people consume the water in the household is recorded as a part of water consumption field test. See Water Consumption Field Test report 2016.
Monitoring frequency	Before first verification and every two years.
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	The value 1,875.74 of Np,y was the data from the last WCFT conducted in 2016. It will be updated before 1st verification of CP2.

Data / Parameter	$LE_{p,y}$
Unit	tCO2e per year
Description	Leakage in project scenario p during year y
Source of data	Monitoring surveys
Value(s) applied	0.01 tCO2e
Measurement methods and procedures	Record all the purchased wood and diesel.
Monitoring frequency	Every two years
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE
Purpose of data	Calculation of leakage emissions
Additional comment	

Data / Parameter	Hygiene Campaigns
Unit	
Description	Hygiene campaigns carried out among project technology users
Source of data	Annual hygiene survey
Value(s) applied	Number of direct and indirect HHs involved in the Campaign
Measurement methods and procedures	See section below B.7.2
Monitoring frequency	Annually
QA/QC procedures	The data will be analysed in the monitoring report and raw data will be available on request to the DOE.
Purpose of data	Engagement of the project in hygiene awareness raising.
Additional comment	

B.7.2. Sampling plan
>>
The project proponent must conduct project studies for each clean water project scenario prior to verifying emissions reductions associated with the given project scenario. This approach uses ex-post project studies from which fuel consumption in the baseline is back-calculated.

A Total Sales Record, Detailed Customer Database, and Project Database will be maintained continuously, while periodic Project Surveys (PS) and Water Consumption Field Test (WCFT) will be performed to measure or estimate parameter values held in the Project Database. Emission reduction calculations are carried out on the basis of the PS and WCFT results.

The monitoring tasks undertaken continuously are:

1. **Maintenance of a Total Sales Record**

CWP units will be sold to domestic and/or institutional end-users through three different channels: retailers; NGOs; direct sales. Therefore, as applicable to this project, the Total Sales Record will consist of a record of all CWP units sold/distributed. The data included will be:

- Date of Sale/Distribution
- Location of Sale/Distribution
- Mode of use: domestic or institutional
- Model/type of CWP sold/distributed
- Number of CWP units sold/distributed
- Name and telephone number (if available) and address (if feasible):

    - Required for all bulk purchasers (i.e. retailers/NGOs)
    - All end users except in cases where this is justified as not feasible
    - The contact details of end-users will be collected as many as commensurate with representative sampling which should not be less than 10 times the survey and field test samples sizes (including usage surveys for each age of product), in order to ensure an adequate end user pool to which random sampling can be applied.

2. Project Database

The project database is derived from the sales record and in order that ER calculations can be conducted appropriately.

3. Project Survey

The safe water project survey is conducted with end users representative of the project scenario target population and currently using the safe water project technology.
The project survey will be conducted in person and would be carried out using representative and random sampling following the GS guidelines for minimum sample size:

Group size <300: Minimum sample size 30
Group 300 to minimum to 1000: Minimum sample size 10% of group size
Group size >1,000: Minimum sample size 100

The project developer chose a minimum sample size of 100 as the number of units sold is greater than 1,000.

Monitoring Survey Representativeness

End users for the project survey are selected using representative sampling techniques to ensure adequate representation of users with technologies of different ages. Common sampling approaches such as clustered random sampling are allowed and geographic distribution will be factored into selection criteria[44]. End users can be surveyed at any time(s) throughout the year with care taken to collect information pertaining to seasonal variations in technology and fuel use patterns.

4. Baseline Water Boiling Test (BWBT)

The BWBT is conducted to calculate the quantity of fuel required to purify by boiling one litre of water for 10 minutes using technologies and fuels representative of the baseline scenario ($W_{b,y}$). The BWBT will be conducted using the 90/30 rule for selection of samples, accounting for variability in the types of

[44] Applicable common sampling approaches are outlined in Section 5, of
the Guideline: Sampling and Surveys for CDM Project Activities and Programmes of Activities, Version 04.0 (CDM-EB67-A06-GUID)

prevalent baseline technologies. If the monitoring surveys reveal that the same water boiling technologies are prevalent in the baseline and project scenarios, $W_{b,y}$ and $W_{p,y}$ are equal. The BWBT should be updated if monitoring surveys show that water boiling technologies change over time.

5. Water Consumption Field Test

The Water Consumption Field Test (WCFT) measures the water consumption volumes and boiling water. The WCFT is conducted with end-users that are using the CWP.
Three volumetric variables are measured:

$Q_{p,y}$ Quantity of safe water in litres consumed in the project scenario p and supplied by CWP per person per day

$Q_{p,rawboil,y}$ Quantity of raw or unsafe water boiled in the project scenario p per person per day

$Q_{p,cleanboil,y}$ Quantity of safe (treated, or from safe supply) water boiled in the project scenario p per person per day

6. Ongoing Monitoring Studies: Usage rates, leakage, water quality, hygiene campaigns

- **Usage rates**

The PP will monitor usage in accordance with the monitoring methodology and the Gold Standard "Guidelines for carrying out usage surveys for projects implementing household water filtration technologies". The guidelines outline six topics which must be successfully completed for the survey respondent to be classed as a user. The guidelines state that "the Project Proponent (PP) needs to clearly define what is deemed a success or a failure for each topic area as part of its usage plan. These guidelines should be used in the survey to determine usage rates and the survey template needs to be provided in the PDD…"

The PP has monitored re-purchasing by retailers and wholesalers over several months. This data provided:
- Evidence that wholesalers and retailers are selling the filters
- Verification of the lag time between purchasing by wholesalers and the final purchase by the end user, as retailers/wholesalers re-purchase CWPs when they run out of stock.

During the first verification, the data analysis about the time lag between purchasing by wholesaler and the final purchased by the user has been conducted. It was reported that there was a time lag between 0.27 and 0.54 month. For simplification, it is assumed that all the sales are spread evenly during a month which makes an average of 0.5 month delay for all the sales. For example, any sale that happened during March will start to claim credits the following month in April.

Usage Survey Questions by Topic

Topic	Question	Type (Reported / Observed)	Cut-off to determine usage	Justification for any alteration of question
Introductory question and water treatment	1. Does anyone in your household do anything to make your water safe to drink? (Do not read aloud options). (Y/N) 2. What do you use to make your drinking water safe? (Do not read aloud	1. Reported 2. Reported 3. Reported 3.a. Reported	1. No = non-use 2. If no CWP response = non-use 3. No – go to 3a 3a. No – Schedule a time to return to speak with person who is regular user.	PP will ask if the person is a regular user instead of primary because in Cambodia household work is often split

	options) (Ceramic Water Purifier/Boil/Purchase bottled/UV light treatment/Solar treatment/ Other (Specify)) 3. Are you a regular user of the CWP in the household? (Do not read aloud options) (Y/N) a. If no, ASK: May I speak with someone in the household who is a regular user?			among several family members.
Rate of usage	1. Has anyone used the CWP in the last week? (Y/N)	1. Reported	1. No = non-use	This simplifies the question instead of providing too many options for response.
Water storage	1. CWP tank and Ceramic Element are present (Y/N)	1. Observed	1. No = non-use	If the safe water storage tank provided with the product and ceramic element are present, the household has a safe water storage
Physical signs of usage	1. Water is present in CWP tank (Y/N) 2. Ceramic filter element is damp (Y/N) If no to both 1 AND 2, ASK: 3. Has there been water in the CWP tank in the past week? (Y/N)	1. Observed 2. Observed 3. Reported	1. No – Go to 2. 2. No – Go to 3. 3. No = non-use.	If the user filtered water the previous day, and then drank this water, the tank could be empty and the ceramic dry, even though they are a user.
Demonstration & knowledge	1. Can you please show me or describe how to filter water? (Respondent knows how to fill with water /Respondent does NOT know how to fill with water)	1. Observed	1. Respondent does NOT know how to fill with water and access water = non-use	None
Functionality	1. Ceramic filter element, tank, and tap are present 2. Ceramic element and tank free of cracks or holes on sides or bottom 3. Tap is functional	1. Observed	1. No = not in use 2. No = non-use 3. No = non-use	These are the basic requirements for functionality of the CWP.

A sample template is provided in Annex 5: Further background information on monitoring plan.

- **Leakage**

Leakage will be assessed every other year and will re-assess the parameters set in section B.6.1.

- **Water quality**

Water quality testing - the monitoring report will include:
- The description of the water quality process which may be conducted by taking the water sample from the end-users to laboratories
- Endorsement by third parties of the testing
- Justification of the appropriateness of the techniques used

- Hygiene survey

PP will conduct hygiene survey in addition to project and usage survey. The survey will ask to assess (1) if the users have general hygienic knowledge on how to handle clean water and (2) if they know how to use and maintain the filter or not. If, yes, they will be asked "how do they know about that?". If no, they will be asked what is the best way to raise awareness of hygiene on handling clean water. Furthermore, the number of hygiene campaigns conducted and estimated number of participants who join the campaign will be reported, annually.

B.7.3. Other elements of monitoring plan
>>

1. **Calculation of emission reductions**

Emission reductions will be calculated using the results of the most recent survey data. The surveys and tests will provide updated values for Leakage, values for Usage factors and also water consumption using the CWP. The updated Leakage values adjust all emission reduction results for the year monitored.

2. **Quality Assurance and Quality Control**

The project proponent is responsible for accurate and transparent record keeping, monitoring and evaluation. All supporting documentation and records for the project will be easily accessible for spot checking and cross referencing by a third party.
The contact information in the total sales record will allow a project auditor to easily contact and visit end users. Auditors will be able to cross reference pertinent project documentation, which will include archives such as production records (i.e. materials purchased, internal logs…) financial accounts and sales records, as well as wholesale customer invoices, observations of retailer activities and sales performance.

3. **Double counting**

As there are other water filters being sold in Cambodia, there is a risk of potential double counting or including water filters from other organizations into this carbon project.
There are three major actions that will ensure that there is no double counting of water filters:

1 - Hydrologic adds a serial number to all water filters produced, these serial numbers are kept in a database;

2 - The water filters from Hydrologic look physically different from the other water filters in the market, making it easy to recognize them;

3 - Hydrologic will only account for the water filters coming out of their factory, thus removing the risk that other water filters may be double counted

SECTION C. Stat date, Crediting period type and duration
C.1. Start date of project activity
>>

The starting date of the project is considered the 09th February 2010 which is the date Hydrologic committed financially by signing a contract with a contractor to build the factory.

C.2. Expected operational lifetime of project activity
>>
21 years.

The operational lifetime of the project is 21 years which is the period during which the project activity is in operation.

As long as there is business for water filters in Cambodia and Hydrologic remains financially viable, then the business will remain open which is expected to be more than 21 years.

The factory opened in Feb. 2010 and the crediting period started in Dec. 2010. Hydrologic confirms that its intention is not to close the factory before January 2032.

C.3. Crediting period of project activity
C.3.1. Type of crediting period
>>
The project is a renewable crediting period type with 3 times 7 years crediting: 01/12/2010 to 30/11/2017 (1st crediting period), 01/12/2017 to 30/11/2024 (2nd crediting period) and 01/12/2024 to 30/11/ 2031 (3rd crediting period).
This is the 2nd crediting period.

C.3.2. Start date of crediting period
>>01/12/2017

C.3.3. Duration of crediting period
This is a renewing crediting.
The duration of this 2nd crediting period is 7 years and 0 months from 01/12/2017 to 30/11/2024.

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>
Not deemed significant other than saving of non-renewable biomass and GHG emissions as already explained. No trans-boundary impacts are expected.

The material used with the water filters can be reused for other purposes and have no negative impact if landfilled.
Pots are made of bottom-pond clay with a mixture of rice husk particles under firing. The clay is one part taken from a local wide-open pond in Kampong Chhnang which is about 3 Kilometres from the factory and other part from local villagers' plot where the owners want to be dug as a pond for fish raising or for farming in the dry season.
Every broken unit or after-use disposal of CWP will produce a very limited impact on the environment:
- The broken units can be used for road reparation (fill out holes on roads or path). They are mainly asked for by local villagers from the factory.
- The unusable (good shape) pot can be used for planting flower
- The plastic elements can be used for than 10 years depending on a good maintenance and care; and they are also able to be recycled, collected by local scrap dealers.

- The unbroken plastic receptacle of CWP can be used to store rice
- There is no toxicity of plastic components; it is PP plastic

D.2. Environmental impact assessment

>>

Not deemed significant by project proponents.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

Please see Gold Standard Stakeholder Consultation and Passport for more details.

E.2. Summary of comments received

>>

Please see Gold Standard Stakeholder Consultation and Passport for more details.

E.3. Report on consideration of comments received

>>

Please see Gold Standard Stakeholder Consultation and Passport for more details.

SECTION F. Approval and authorization

>>

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Appendix 1: Contact information of project participants

Organization name	Hydrologic Social Enterprise Ltd.
Street/P.O. Box	Street 15BT (Ta Phon), Sansom Kosal 1, Boeung Tumpun
Building	House 97A,
City	Phnom Penh
State/Region	
Postcode	
Country	Cambodia
Telephone	+855 (0)23 6911 981
Fax	-
E-mail	info@hydrologichealth.com
Website	www.hydrologichealth.com
Contact person	
Title	
Salutation	Mr.
Last name	Roberts
Middle name	Scott
First name	Michael
Department	
Mobile	
Direct fax	
Direct tel.	(855) 23 223 541
Personal e-mail	mroberts@ide-cambodia.org

Appendix 2: Affirmation regarding public funding

Date: 13 October 2011

To: Gold Standard Foundation

Re: Declaration of Non-Use of Official Development Assistance by Project Owner
Project Reference **GS 1020** Hydrologic Social Enterprise

As Project Owner of the above-referenced project, acting on behalf of all project participants, I now make the following representations:

I. Gold Standard Documentation

I am familiar with the provisions of Gold Standard Documentation relevant to Official Development Assistance (ODA). I understand that the above-referenced project is not eligible for Gold Standard registration if the project receives or benefits from Official Development Assistance under the condition that some or all credits coming out of the project are transferred to the ODA donor country. I now expressly declare that no financing provided in connection with the above-referenced project has come from or will come from ODA that has been or will be provided under the condition, whether express or implied, that any or all of the credits [CERs, ERUs or VERs] issued as a result of the project's operation will be transferred directly or indirectly to the country of origin of the ODA.

II. Duty to Notify Upon Discovery.

If I learn or if I am given any reason to believe at any stage of project design or implementation that ODA has been used to support the development or implementation of the project, or that an entity providing ODA to the host country may at some point in the future benefit directly or indirectly from the credits generated from the project as a condition of investment, I will make this known to the Gold Standard immediately.

III. Sanctions.

I am fully aware that under Section 10 of the Gold Standard Terms and Conditions sanctions and damages may be incurred for the provision of false information related to Projects and/or Gold Standard credits.

Signed: M.Roberts
Name: Michael Roberts
Title: Director
On behalf of: Hydrologic Social Enterprise

Hydrologic Social Enterprise
#38B, St. 494, Sangkat Phsar Deum Thkov, Khan Chamkamon, Phnom Penh, Cambodia, Tel: (855) 23 691 1981/ 630 2620.
info@hydrologichealth.com | www.hydrologichealth.com

USAID | ASIA
FROM THE AMERICAN PEOPLE

March 11, 2011

Gold Standard Foundation
Avenue Louis-Casai 79
CH-1216 Geneva-Cointrin
Switzerland

Subject: Hydrologic's Carbon Financing Application

To Whom It May Concern,

This letter is to inform that to the best of my knowledge, Hydrologic Social Enterprise (formerly of International Development Enterprises – Cambodia) hereinafter referred to as "Hydrologic" has never publicly announced any plans to launch a new production facility nor to operate independently without the support of external financing.

Prior to recent funding support from USAID, the IDE ceramic water filter project was actually planned to be discontinued.

USAID funding has provided seed capital for the past 2 years (FY 2009-2010) that allowed Hydrologic to spin off from IDE, continue distributing water filters, and search for alternative sources of revenue. The revenue from sale of emissions reductions credits will be critical to Hydrologic becoming an on-going, sustainable enterprise capable of providing emissions-free household water treatment options to rural households.

Respectfully,

Saengroaj Srisawaskraisorn
Program Development Specialist
USAID Regional Development Mission for Asia

U.S. Agency for International Development
Regional Development Mission / Asia
Diethelm Towers A, 93/1 Wireless Road,
Bangkok 10330, Thailand
Tel: 662-263-7400
Fax: 662-263-7499

Appendix 3: Applicability of selected methodology

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

BASELINE INFORMATION

Please refer to baseline report for more information.

The table below shows an estimate of the breakdown of units produced and emissions reductions per month. Units sold are the actual verified units sold to 30th April 2016 and sale database from 1st May 2016 to 30 April 2017. Beyond that date, units sold are estimated as the average units sold to April 2017. This is only an estimate, real sales figure may vary every month - this will be updated for verification/issuance.

Year	Month	Units sold	Units in use	Baseline Emissions - tCO2e/mo	Project Activity - tCO2e/mo	Cumu lative usage rate (fra)	Passing rate of water quality test (fra)	Leaka ge - tCO2e /mo	tCO2e/ mo
2017	Dec	4,286	242,798	25,768.41	13,773.29	0.81	0.80	198	7,527.77
2018	Jan	4,283	247,083	26,223.25	14,016.40	0.81	0.80	201	7,660.65
2018	Feb	4,280	251,366	26,677.79	14,259.35	0.81	0.80	205	7,793.43
2018	Mar	4,277	255,646	27,132.04	14,502.15	0.81	0.80	208	7,926.13
2018	Apr	4,275	259,924	27,585.99	14,744.79	0.81	0.80	212	8,058.75
2018	May	4,272	200,055	21,232.08	11,348.60	0.80	0.80	163	6,142.50
2018	Jun	4,269	204,327	21,685.44	11,590.93	0.80	0.80	166	6,273.66
2018	Jul	4,266	208,596	22,138.51	11,833.10	0.80	0.80	170	6,404.73
2018	Aug	4,263	212,862	22,591.29	12,075.11	0.80	0.80	173	6,535.72
2018	Sep	4,261	217,125	23,043.77	12,316.96	0.80	0.80	177	6,666.62
2018	Oct	4,258	221,386	23,495.96	12,558.65	0.80	0.80	180	6,797.44
2018	Nov	4,255	225,644	23,947.85	12,800.19	0.80	0.80	184	6,928.18
2018	Dec	4,252	229,899	24,399.45	13,041.57	0.80	0.80	187	7,058.83
2019	Jan	4,250	234,151	24,850.75	13,282.80	0.80	0.80	191	7,189.39
2019	Feb	4,247	238,401	25,301.76	13,523.86	0.80	0.80	194	7,319.87
2019	Mar	4,244	242,648	25,752.48	13,764.77	0.80	0.80	198	7,450.26
2019	Apr	4,241	246,892	26,202.90	14,005.52	0.80	0.80	201	7,580.57
2019	May	4,238	207,147	21,984.74	11,750.91	0.79	0.80	169	6,313.38
2019	Jun	4,236	211,385	22,434.58	11,991.34	0.79	0.80	172	6,442.56
2019	Jul	4,233	215,621	22,884.12	12,231.62	0.79	0.80	176	6,571.65
2019	Aug	4,230	219,854	23,333.36	12,471.75	0.79	0.80	179	6,700.66
2019	Sep	4,227	224,084	23,782.31	12,711.71	0.79	0.80	183	6,829.59
2019	Oct	4,225	228,312	24,230.97	12,951.52	0.79	0.80	186	6,958.43
2019	Nov	4,222	232,536	24,679.33	13,191.17	0.79	0.80	189	7,087.19

2019	Dec	4,219	236,758	25,127.40	13,430.66	0.79	0.80	193	7,215.86
2020	Jan	4,216	240,977	25,575.17	13,670.00	0.79	0.80	196	7,344.45
2020	Feb	4,214	245,193	26,022.65	13,909.18	0.79	0.80	200	7,472.95
2020	Mar	4,211	249,407	26,469.83	14,148.20	0.79	0.80	203	7,601.37
2020	Apr	4,208	253,618	26,916.72	14,387.06	0.79	0.80	207	7,729.70
2020	May	4,205	212,058	22,505.91	12,029.47	0.80	0.80	173	6,509.50
2020	Jun	4,202	216,263	22,952.21	12,268.02	0.80	0.80	176	6,638.59
2020	Jul	4,200	220,465	23,398.22	12,506.41	0.80	0.80	180	6,767.59
2020	Aug	4,197	224,665	23,843.93	12,744.65	0.80	0.80	183	6,896.50
2020	Sep	4,194	228,862	24,289.35	12,982.73	0.80	0.80	186	7,025.33
2020	Oct	4,191	233,056	24,734.48	13,220.65	0.80	0.80	190	7,154.08
2020	Nov	4,189	237,247	25,179.31	13,458.41	0.80	0.80	193	7,282.74
2020	Dec	4,186	241,436	25,623.84	13,696.01	0.80	0.80	197	7,411.32
2021	Jan	4,183	245,621	26,068.09	13,933.46	0.80	0.80	200	7,539.81
2021	Feb	4,180	249,804	26,512.03	14,170.75	0.80	0.80	204	7,668.21
2021	Mar	4,177	253,985	26,955.69	14,407.89	0.80	0.80	207	7,796.53
2021	Apr	4,175	258,162	27,399.05	14,644.87	0.80	0.80	210	7,924.77
2021	May	4,172	203,513	21,599.05	11,544.75	0.80	0.80	166	6,240.14
2021	Jun	4,169	207,685	22,041.82	11,781.42	0.80	0.80	169	6,368.06
2021	Jul	4,166	211,854	22,484.30	12,017.92	0.80	0.80	173	6,495.90
2021	Aug	4,164	216,020	22,926.48	12,254.27	0.80	0.80	176	6,623.65
2021	Sep	4,161	220,184	23,368.37	12,490.46	0.80	0.80	179	6,751.31
2021	Oct	4,158	224,345	23,809.96	12,726.49	0.80	0.80	183	6,878.89
2021	Nov	4,155	228,503	24,251.26	12,962.37	0.80	0.80	186	7,006.39
2021	Dec	4,153	232,658	24,692.27	13,198.09	0.80	0.80	190	7,133.80
2022	Jan	4,150	236,811	25,132.98	13,433.65	0.80	0.80	193	7,261.13
2022	Feb	4,147	240,960	25,573.40	13,669.05	0.80	0.80	196	7,388.37
2022	Mar	4,144	245,107	26,013.52	13,904.30	0.80	0.80	200	7,515.52
2022	Apr	4,141	249,251	26,453.35	14,139.39	0.80	0.80	203	7,642.59
2022	May	4,139	201,916	21,429.56	11,454.16	0.80	0.80	164	6,191.14
2022	Jun	4,136	206,054	21,868.80	11,688.93	0.80	0.80	168	6,318.04
2022	Jul	4,133	210,190	22,307.74	11,923.55	0.80	0.80	171	6,444.85
2022	Aug	4,130	214,323	22,746.40	12,158.01	0.80	0.80	175	6,571.58
2022	Sep	4,128	218,454	23,184.75	12,392.31	0.80	0.80	178	6,698.23
2022	Oct	4,125	222,581	23,622.82	12,626.46	0.80	0.80	181	6,824.79
2022	Nov	4,122	226,706	24,060.58	12,860.45	0.80	0.80	185	6,951.26
2022	Dec	4,119	230,828	24,498.06	13,094.28	0.80	0.80	188	7,077.65
2023	Jan	4,116	234,947	24,935.24	13,327.95	0.80	0.80	191	7,203.95
2023	Feb	4,114	239,064	25,372.12	13,561.47	0.80	0.80	195	7,330.17
2023	Mar	4,111	243,178	25,808.72	13,794.83	0.80	0.80	198	7,456.31
2023	Apr	4,108	247,288	26,245.01	14,028.03	0.80	0.80	201	7,582.36
2023	May	4,105	200,319	21,260.07	11,363.56	0.80	0.80	163	6,142.14
2023	Jun	4,103	204,424	21,695.77	11,596.45	0.80	0.80	167	6,268.01

2023	Jul	4,100	208,527	22,131.19	11,829.18	0.80	0.80	170	6,393.81
2023	Aug	4,097	212,627	22,566.31	12,061.75	0.80	0.80	173	6,519.52
2023	Sep	4,094	216,724	23,001.13	12,294.17	0.80	0.80	177	6,645.14
2023	Oct	4,092	220,818	23,435.67	12,526.43	0.80	0.80	180	6,770.68
2023	Nov	4,089	224,909	23,869.90	12,758.53	0.80	0.80	183	6,896.13
2023	Dec	4,086	228,998	24,303.85	12,990.47	0.80	0.80	187	7,021.50
2024	Jan	4,083	233,084	24,737.50	13,222.26	0.80	0.80	190	7,146.78
2024	Feb	4,080	237,167	25,170.85	13,453.89	0.80	0.80	193	7,271.98
2024	Mar	4,078	241,248	25,603.91	13,685.36	0.80	0.80	197	7,397.09
2024	Apr	4,075	245,325	26,036.68	13,916.68	0.80	0.80	200	7,522.12
2024	May	4,072	198,722	21,090.57	11,272.97	0.80	0.80	162	6,093.17
2024	Jun	4,069	202,794	21,522.75	11,503.97	0.80	0.80	165	6,218.03
2024	Jul	4,067	206,863	21,954.63	11,734.81	0.80	0.80	169	6,342.80
2024	Aug	4,064	210,930	22,386.22	11,965.50	0.80	0.80	172	6,467.49
2024	Sep	4,061	214,994	22,817.52	12,196.03	0.80	0.80	175	6,592.09
2024	Oct	4,058	219,055	23,248.52	12,426.40	0.80	0.80	178	6,716.61
2024	Nov	4,055	223,113	23,679.22	12,656.61	0.80	0.80	182	6,841.04

Appendix 5: Further background information on monitoring plan

SAMPLE USAGE SURVEY TEMPLATE

1. DOES ANYONE IN YOUR HOUSEHOLD DO ANYTHING TO MAKE YOUR WATER SAFE TO DRINK?

   DO NOT READ ALOUD OPTIONS

   ☐ YES – GO TO Q2.
   ☐ NO – **NOT IN USE - GO TO Q12.**
   ☐ DO NOT KNOW – **ASK TO SPEAK TO PERSON WHO WOULD KNOW AND REPEAT Q1.**

2. WHAT DO YOU USE TO MAKE YOUR DRINKING WATER SAFE?

   DO NOT READ ALOUD OPTIONS. CHECK ALL THAT APPLY.
   AFTER FIRST ANSWER, PROBE – ANYTHING ELSE?

   ☐ CERAMIC WATER PURIFIER – **IF NOT TICKED, NOT IN USE - GO TO Q12.**
   ☐ BOIL WATER
   ☐ PURCHASE BOTTLED
   ☐ UV LIGHT TREATMENT
   ☐ SOLAR TREATMENT
   ☐ OTHER (SPECIFY) ________________

3. ARE YOU A REGULAR USER OF THE CWP IN THE HOUSEHOLD?

   ☐ YES – **GO TO QUESTION 4.**
   ☐ NO – **GO TO QUESTION 3.1**

   3.1. MAY I SPEAK WITH SOMEONE IN THE HOUSEHOLD WHO IS REGULAR USER?

   ☐ YES – **ASK TO SPEAK WITH THEM AND CONTINUE TO QUESTION 4.**

☐ NO – **ASK WHEN SOMEONE WILL BE AVAILABLE AND SCHEDULE A RETURN VISIT.**

4. HAS ANYONE USED THE CWP IN THE LAST WEEK?
   ☐ YES
   ☐ NO **- NOT IN USE - GO TO Q12.**

ASK TO OBSERVE THE CWP.
OBSERVE:

5. CWP TANK AND CERAMIC ELEMENT ARE PRESENT
   ☐ YES
   ☐ NO – **NOT IN USE - GO TO Q12.**

6. CERAMIC ELEMENT AND TANK FREE OF CRACKS OR HOLES ON SIDES OR BOTTOM
   ☐ YES, FUNCTIONAL
   ☐ NO, DAMAGED – **NOT IN USE - GO TO Q12.**

7. TAP IS FUNCTIONAL
   ☐ YES, FUNCTIONAL
   ☐ NO, DAMAGED – **NOT IN USE - GO TO Q12.**

8. WATER IS PRESENT IN CWP TANK
   ☐ YES
   ☐ NO

9. FILTER IS DAMP
   ☐ YES
   ☐ NO

IF "NO" TO WATER PRESENT AND FILTER DAMP, ASK:

9.1. HAS THERE BEEN WATER IN THE TANK IN THE PAST WEEK?
   ☐ YES – **GO TO QUESTION 8.**
   ☐ NO – **NOT IN USE - GO TO Q12.**

ASK AND OBSERVE:

10. CAN YOU PLEASE SHOW ME OR DESCRIBE HOW TO FILTER WATER?
   ☐ RESPONDENT KNOWS HOW TO USE
   ☐ RESPONDENT DOES NOT KNOW HOW TO USE – **NOT IN USE - GO TO Q12.**

11. RA TO RECORD IF FILTER IS IN USE BASED ON RESPONSES ABOVE:
   ☐ YES **– FILTER IN USE.**
   ☐ NO **- END OF SURVEY.**

NOTE: The PP may alter this basic template or add questions, but will not change the substance of the questions to meet the requirements of the usage survey guidelines.

For more information, please refer to section B.7.2 of the PDD.

Appendix 6: Summary report of comments received from local stakeholders

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Concern if CWP's spare part is available or not was raised by Mr. Sum Socheat. deputy chief of GHG inventory and mitigation office, ministry of environment	Yes	All the components of the filter including ceramic pot, spigot, water storage container can be purchased from Hydrologic sale staff.
Question about the usage life of CWP was also raised by Mr. Sum Socheat. deputy chief of GHG inventory and mitigation office, ministry of environment	Yes	Based on practical use, it is observed that a good and efficient filter (ceramic pot) is about 3years old. But according to Campbell (2005) who conduct a study on life span of ceramic water filter, the ceramic pot can be used for more than 5 years[45] without losing its capacity for removal of total coliform and E.Coli.
Concern if the filter provide enough clean water for a family of five people was raised by Mr. Prum Mao, NGO (Samaritas) official.	Yes	The filter can store up to 14 liters and it would be enough for daily drinking. Moreover, it can serve or supply up to 27 liters per day if household fills in 3 times.
Concern of capacity of CWP to provide clean water for big family, school and health center was also raised by Mr. Prum Mao, NGO (Samaritas) official.	No	Hydrologic has been considering to develop a bigger filter that can produce and store larger amount of water to be used at school, health center or community use. However, this product is still in the research and development stage.
Question if the filter is broken, how user can contact Hydrologic was raised by Mr. Chum Nha, Governor, Banan district	Yes	The users could find contact number of the company on the filter, on Hydrologic's usual manual or on any of Hydrologic promotion material.

[45] Campbell (2005) *Study on Life Span of Ceramic Filter - Colloidal Silver Pot Shaped (CSP) Model*. Potters for Peace. Managua.

Appendix 7: Summary of post-registration changes

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The project's PDD has been gone through three version: registered PDD version 7 -10/09/2012, design change PDD version 10.0 – 25/03/2014. and renewal crediting period PDD version 11.2 – 05/02/2018.

Designed change PDD version 10.0

- Change 1: PDD is updated from small-scale to large scale project in 2013 because its emission reduction exceeded the small-scale limit of 180GWh of energy saved per annum. The effective design change date was on 01/05/2013. For the details of the changes, please refer to Hydrologic (2014) Design Change Memo_2014-03-19 and DC_GS1020_Design Change Review_final 2014-03-27 files.

Renewal crediting period PDD version 11.2

The proposed changes for this version of PDD can be summarized in the following:

- Change 1: The starting date for new crediting period will be from 1 Dec 2017 to 30 Nov 2024
- Change 2: The methodology applied is Technologies and Practices to Displace Decentralized Thermal Energy Consumption (TPDDTEC) version 3.0 instead of previous version (version 1.0)
- Change 3: Cj was changed from 2.6% in CP1 to 25.97% in CP2,
- Change 4: Xboil factor is introduced with TPDDTEC version 3.0 but there was no Xboil factor in TPDDTEC version 1.0.
- Change 5: For type of stove used in the baseline, beside traditional and improved cook stove, LPG stove is added based on the new baseline survey results.
- Change 6: Wood to charcoal factor is introduced to calculate emission from charcoal. This was not included in the previous version of PDD.

History of the document

Version	Date	Description
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan;

		• **Provisions related to local stakeholder consultation;** • **Provisions related to the Host Party;** • **Make editorial improvement.**
05.0	**25 June 2014**	**Revision to:** • **Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0));** • **Include provisions related to standardized baselines;** • **Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1;** • **Change the reference number from F-CDM-PDD to CDM-PDD-FORM;** • **Make editorial improvement.**
04.1	**11 April 2012**	**Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.**
04.0	**13 March 2012**	**Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).**
03.0	**26 July 2006**	**EB 25, Annex 15**
02.0	**14 June 2004**	**EB 14, Annex 06b**
01.0	**03 August 2002**	**EB 05, Paragraph 12** **Initial adoption.**

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: project activities, project design document