Gold Standard for the Global Goals

Monitoring report

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT – **TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	GS1020
Title of the project (s) covered by monitoring report	Production and dissemination of Ceramic Water Purifiers by Hydrologic in the Kingdom of Cambodia
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	11.2
Version number of the monitoring report	5.0
Completion date of the monitoring report	07/07/2021
Date of project design certification	08/08/2012 (CPII renewal 28/12/2017)
Date of Last Annual Report	NA
Monitoring period number	3rd of the 2nd crediting period
Duration of this monitoring period	01/01/2020- 31/12/2020 (including both days)
Project Representative	Hydrologic Social Enterprise Ltd.
Host Country	Cambodia
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 3.0-July 2015
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG1. No Poverty	Amount of fuel save after using project technology	65,540	Tonne of Biomass
		956	Tonne of LPG
	Percentage of household noted on money save	82.10	%
	Percentage of household noted on time save after using the project technology	91.20	%
SDG3. Good Health and well being	Number of people who notice less smoke in kitchen after having water filter	566,367	People
SDG5. Gender Equality	Number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel	253,713	People
SDG6. Clean water and sanitation	Number of people with access to safe drinking water	746,201	People
SDG7: Affordable and clean energy	Amount of energy saves from avoiding boiling water in the project activity	1,028	TJ
SDG8: Decent work and economic growth	Number of new jobs created by the project with safe and healthy work environment	85	People
SDG13: Climate action	Total emission reduction	93,878	VERs
SDG15: Life on Land	the areas of forest save	404	Hectare

Table 2 – Product Vintages

		Amount Achieved		
Start Dates	**End Dates**	**VERs**	**…**	**…**
01/01/2020	31/12/2020	93,878		

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

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 are manufactured using locally available skills and are simple, low cost and easy to use. In December 2010, IDE Cambodia spun off its CWP manufacturing program creating a subsidiary called Hydrologic Social Enterprise. The project has started since 2010 and registered as a carbon project under a standard named "the Gold Standard" (GS) in 2012. By registering as GS project, the project could mobilize extra fund for its implementation besides selling the water filter, i.e. Hydrologic has been able to expand its sale network to remote areas.

Project milestone:

- Start date of the project is 09/02/2010, which was the date Hydrologic committed financially by signing a contract with a contractor to build the factory, GS registration date: 08/08/2012 (date of CP2 renewal was: 28/12/2017)
- GS Crediting period start date: 1st crediting period: 01/12/2010, 2nd crediting period: 01/12/2017
- The expected project operational lifetimes is 21 years. 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.

As mentioned above, the factory opened in February 2010 and the 1st crediting period stared in December 2010. Hydrologic confirms that its intention is not to close the factory before January 2032.

A.2. Location of project

The project boundary for the distribution of the Hydrologic Ceramic Water Purifiers is the Kingdom of Cambodia. The project proponent has a purpose-built factory to produce the CWPs near Kampong Chhnang province, Cambodia. With the main three sale channels, hydrologic has been actively selling its CWPs throughout the country.

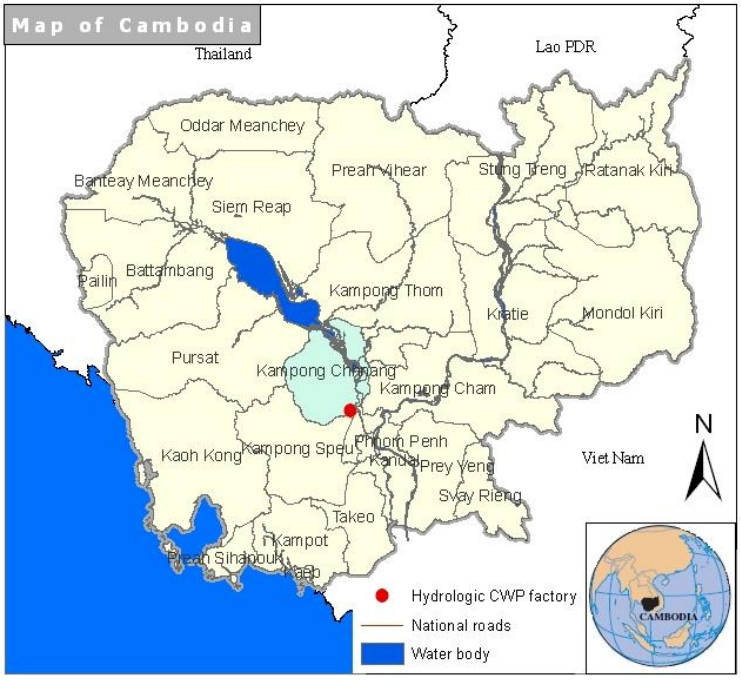


Figure 1 - Map of Cambodia

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

The coordinates below correspond to the location of Hydrologic's factory.

Latitude	11.8504° N
Longitude	104.7419° E

Based on online resource (https://latitudelongitude.org/kh/), the coordinates of all the provinces, cities, and capital which are under the project target are listed below:

No	Name of province/city/capital	Latitude	Longitude
1	Banteay Meanchey	13°35'9.17"N	102°58'25.28"E
2	Battambang	13°6'9.76"N	103°11'53.59"E
3	Kampong Cham	11°59'36.2"N	105°27'48.6"E
4	Kampong Chhnang	12°15'0"N	104°40'0.01"E
5	Kampong Speu	11°27'11.95"N	104°31'15.06"E
6	Kampong Thom	12°42'40.03"N	104°53'19.43"E
7	Kampot	10°36'37.48"N	104°10'53.22"E
8	Kandal	11°28'59.99"N	104°57'0"E
9	Kep	10°28'58.48"N	104°19'0.19"E
10	Koh Kong	11°36'55.12"N	102°59'1.68"E
11	Kratie	12°29'17.2"N	106°1'7.64"E
12	Mondul Kiri	12°27'20.99"N	107°11'17.2"E
13	Oddar Meanchey	14°10'54.3"N	103°31'3.4"E
14	Pailin	12°50'56.22"N	102°36'33.41"E
15	Phnom Penh	11°33'44.82"N	104°54'57.64"E
16	Preah Sihanouk	10°36'33.55"N	103°31'46.49"E
17	Preah Vihear	13°48'26.32"N	104°58'49.66"E
18	Prey Veng	11°29'12.55"N	105°19'31.19"E
19	Pursat	12°32'19.61"N	103°55'9.12"E
20	Ratanak Kiri	13°44'21.8"N	106°59'14.17"E
21	Siemreap	13°21'42.44"N	103°51'38.02"E
22	Stung Treng	13°31'33.1"N	105°58'5.88"E
23	Svay Rieng	11°5'16.26"N	105°47'57.66"E
24	Takeo	10°59'26.92"N	104°47'5.93"E
25	Tboung Khmum	11.9214° N	105.6002° E

A.3. Reference of applied methodology

Technologies and Practices to Displace Decentralized Thermal Energy Consumption, version 3.0 - July 2015.

A.4. Crediting period of project

Start date of CP: 01/12/2017 (2nd CP)
End date of CP: 30/11/2024 (2nd CP)
Length of second crediting period: 7 years

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

The project sold 33,746[1] Ceramic Water Purifiers (CWPs) during the period from 01/01/2020 to 31/12/2020 and reduced 93,878 tonnes[2] of GHG emissions (tCO_2e). During that period, PP has been monitoring closely all the activities as required by the GS.

This project is an end-use energy efficiency improvement project, registered under the Voluntary Gold Standard methodology: "Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 3.0 - July 2015".

The project has been implemented as described in the PDD in section A.3. The technology used during this monitoring period is the same as described in the PDD. There has been no change in the technology.

Project Activities

The starting date of operation of the project activity was 09/02/2010[3], which was the date Hydrologic committed financially by signing a contract with a contractor to build the factory production of CWPs.

The Ceramic Water Purifiers are sold throughout Cambodia and are not all installed at the start of the project but are installed progressively during the 1st and 2nd crediting period. The table below reflects the installation number per month from 01/01/2020 to 31/12/2020 (including both days).

Table 2 - Summary of sales during the current monitoring period

Distribution period		Type of CWPs		Units sold
From	To	Super Tunsai	Original Tunsai	Total
1-Jan-20	31-Jan-20	1,139	1,080	2,219
1-Feb-20	28-Feb-20	1,965	1,058	3,023

[1] Source: Sale database

[2] Source: ER calculation spreadsheet, Tab: Nexus_Summary, cell F9.

[3] Source: registered PDD

1-Mar-20	31-Mar-20	1,777	226	2,003
1-Apr-20	30-Apr-20	1,035	765	1800
1-May-20	31-May-20	1,834	265	2099
1-Jun-20	30-Jun-20	1,623	488	2111
1-Jul-20	31-Jul-20	2,008	226	2234
1-Aug-20	31-Aug-20	1,672	573	2245
1-Sep-20	30-Sep-20	1,611	3,596	5207
1-Oct-20	31-Oct-20	1,124	386	1510
1-Nov-20	30-Nov-20	1,683	300	1983
1-Dec-20	31-Dec-20	2,071	5,241	7312
Total		**19,542**	**14,204**	**33,746**

Hydrologic produced all the filters at their purpose-built factory in Cambodia. Local production using locally available skills has continued to provide low-cost production while providing gainful employment to local people. Hydrologic manufactures two type of water filters: Original Tunsai and Super Tunsai. Both have the same characteristics as illustrated in Figure 2 and Figure 3, 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.

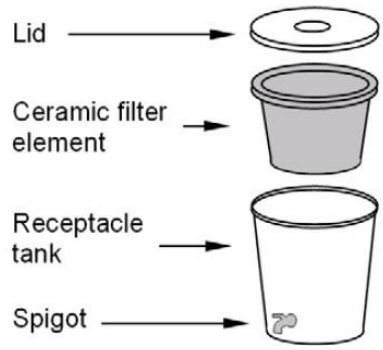
Tunsai Ceramic Water Purifier Elements:	Tunsai Ceramic Water Purifier Data:	
	Filter Element Type	Ceramic Clay Pot
	Filter Capacity (volume)	Approx. 10 L
	Filter Capacity (flow)	Typ. 2-3 L/Hr Typ. 30L/day
	Receptacle Type	Closed safe storage food grade plastic receptacle
	Receptacle Storage Capacity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

Figure 2. Original Tunsai and its technical specification

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

Figure 3. Super Tunsai and its technical specification

Hydrologic has maintained a total sales record of all sales through three main channels:

- Direct sales to end users by Hydrologic sales staff
- Sales to retail sales agents who purchase CWPs whole sale and sell them to retailers and local intermediaries
- NGOs that purchase wholesale CWPs and typically sell them at a subsidized price.

For direct sales, Hydrologic holds meetings to share with interested communities the potential benefits of the CWP. At these meetings, households who are interested in purchasing CWP but couldn't afford to pay all the cost at once, they can purchase it by instalment if their repayment capacity is good based on Hydrologic credit team assessment. For retail sales, sales agents working on commission sell CWPs to retailers throughout several provinces. Hydrologic also sells the purifiers to NGOs wishing to distribute or sell the CWPs at subsidized rates.

Under this monitoring period, all the three main sale channels, the selling price to the end user might not be the same. Hydrologic sells CWPs to NGOs with special price of 13.5$ for Original Tunsai and 32$ for Super Tunsai. Then, the NGOs sell or grant them to end users. For direct sale managed by Hydrologic in which only Super Tunsai is sold, the selling price to end user is 39.00 USD by cash and 45USD by instalment (6 months term). Finally, for retailer, Hydrologic sell CWPs to them with special price of 13.5 $ for Original Tunsai and 32$ for Super Tunsai. The selling price to end user is varies depending on the negotiation between buyer and seller, but Hydrologic recommend them to selling it with the price around 20.00$ for Original Tunsai and 39.00 $ for Super Tunsai.

Additionally, throughout the monitoring period, Hydrologic has maintained a project database containing the contact details of end users to the extent possible of 113,609 users[4].

During Dec 2020, Hydrologic has contracted Angkor Research and Consulting company to conduct Water Consumption Field Test (WCFT) and the monitoring survey including usage survey and project survey to accurately calculate the monitoring parameters outlined in the Project Design Document and GS4GG transition Annex. The surveys and WCFT were conducted with its own specific purpose and with different number of required samples. The sample selection also took into account the different age group of CWP (age 1 to age 5) from the project database in which end-users from 01 July 2015 to 30 June 2020 are eligible to be included in this sample selection for conservative approach based on the registered methodology TPDDTEC V3.0[5] and the required samples were derived as per the parameters and conditions laid down in the methodology section of the monitoring survey report[6]. Number of surveyed households per each survey is shown in below table:

No	Survey	Number of end user eligible for this sample selection[7]	Number of surveyed households
1	Usage survey	113,609	185
2	Project survey	113,609	161[8]
3	Water Consumption Field Test	113,609	140[9]

[4] Project database, cell T10.
[5] Footnote 33 of TPDDTEC V3.0
[6] ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, pages 6-8.
[7] Sample_Frame&Project_Data2015-2020, Tab Summary "cell S29"
[8] The 161 households were among the 185 households who participated in usage survey.
[9] The 140 households were among the 161 household who participated in the project survey.

Hydrologic has implemented ongoing monitoring of sales, end-user contact details, usage rates and leakage. The sales database records monthly sales of the CWPs and the project database records end-user information, when feasible. Hydrologic has monitored the usage rates of the CWPs through the usage survey to ensure the project claims an appropriate useful life of the technology. End-users have the opportunity to replace broken parts or the entire unit at no cost through a 2-year warranty system. This system extends the lifespan of the CWP by providing a warranty card with the information necessary to replace broken parts or units in the box of each CWP. End-users are also provided with detailed instructions outlining the proper care and maintenance of the CWP. During this monitoring period, as part of its improvement of monitoring and maintenance service, Hydrologic has included the training on "Product use, Maintenance and Hygiene" into their sale training course agenda. Hence, sale staff can perform not only sale but also provide maintenance service in the field. In this monitoring period, due to CoVid-19, only one training sessions (3&4-Aug-2020) were conducted with a total participant of 9 field staff[10].

Hydrologic has also monitored the sources of leakage identified by the leakage assessment conducted in the first Monitoring Period of CP1, namely wood purchased for firing the CWPs in the factory kilns, diesel and gasoline consumption for generator use at the factory for this MP.

Hydrologic has also fully implemented the actions mitigating against double counting as outlined in the PDD, including:

i. Hydrologic has added a serial number to all water filters produced and kept the numbers in a database[11]
ii. The design of the water filters from Hydrologic look physically different from other water filters in the market, making it easy to recognize them; and
iii. 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[12].

There were no delays compared to information in approved project.

[10] HSE-CP2MP3_Staff_Training_Report

[11] HSE_CP2MP3_Serial Number

[12] Sales Database

B.1.1. Forward Action Requests

During the third (3rd) verification (Monitoring Period 3rd: 01/05/2013 – 30/04/2014), one FAR was raised by GS. It should be noted that this FAR was addressed in CP1 but for CP2, PD continue to monitor the replacement of ceramic filter element for better understanding the working performance of the ceramic water purifier.

Description of FAR	Raised by (VVB, GS)	Summary of Project participant response
According to the registered PDD in the 1st crediting period "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 PP is requested to provide details on number of ceramic filter element replaced (age group wise) in next monitoring period.	GS	Project Proponent has tracked the replacement of ceramic filter element (age group wise) and has incorporated the details in a table (see below) in this monitoring period.

During the current monitoring period, replacement was done for Pots and for spigots (tap). However, Hydrologic has calculated the replacement rate by taking the overall replacement (Pots and spigot) during the monitoring period.

Hydrologic has disseminated 33,746 units during the monitoring period from 01/01/2020 to 31/12/2020 and 183,775[13] cumulatively credited units over CP2-MP3. It should be noted that in the cumulative credited units five or older years old CWP's age were retired. During this CP2-MP3, 1,923 CWP's pots were replaced which representing 1.04% of the cumulative units credited as of 31 Dec 2020.

[13] ER spreadsheet, tab Units per month, cell H126

Filter elements replacement and number of visited units each Age Group[14]								
Category	**0-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-6 &Older**	**No age record**	**Total**
Pot	370	624	227	278	102	151	171	1,923
Spigot	3	9	0	1	0	1	12	26
Total replacement	373	633	227	179	102	152	183	1,949

Another FAR has been raised by GS during the 5th monitoring period (MP5: 01/05/2015-30/04/2016). This FAR has been addressed as following table:

Description of FAR	Raised by (VVB, GS)	Summary of Project participant response
The PP shall improve the sale data collection system to avoid any duplicate in next monitoring period. More trainings shall be provided to database implementer	GS	It should be noted that the sale database system has been well managed so far but the project database has been found some issues related to duplicated record of CWP's users during MP5 monitoring period. To address this issue during this monitoring period (CP2-MP3), PP has followed previous action by inviting a carbon consultant from Nexus to conduct a database refreshing training[15] in Oct 2020 to their customer service team who is responsible for recording project database. Furthermore, PP has created an automated checking column in the project database spreadsheet to alert if the information is duplicated in "the project database".

B.2. Post-Design Certification changes

[14] Replacement_Report_Data2019, tab Summary

[15] HSE_CP2MP3_minute_database_training

N/A

B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

N/A

B.2.2. Corrections

N/A

B.2.3. Changes to start date of crediting period

N/A

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

N/A

B.2.5. Changes to project design of approved project

N/A

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

The project proponent has been conducting the following monitoring activities:

Project Surveys (PS)

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 is 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 survey has a minimum sample size of 100 as the number of units sold is greater than 1,000.

End users for the project survey is 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 is factored into selection criteria[16]. 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.

For this monitoring period, the project survey was conducted in Dec 2020 together with usage survey and WCFT for participants that are currently using the project technology. More detail about the project survey design and result could be found in the project study report and in section D4.

[16] 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)

Water Consumption Field Test

The Water Consumption Field Test (WCFT) measures the project-supplied clean water consumption volumes and boiling. The WCFT is conducted with end-users representative of project scenario target population and currently using the CWP.

Number of person consuming water from the project technology and three volumetric variables are measured:

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

$Q_{p,y}$ Quantity of safe water in liters 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

For this monitoring period, WCFT was conducted in conjunction with project and usage survey with the total participants of 140 end-users. However, during the analysis, 15 households were excluded from the analysis due to negative reported water consumption or no water consumption value[17]. Thus, only 125 samples are valid for WCFT analysis which is still within the recommended sample range between 101 and 137 sample by TPDDTEC 3.0. The below table shows that the mean value of number of person consuming water in the household per day and $Q_{p,y}$ is 5.23 persons and 1.19 liter respectively and its margin of error at 90% level of confidence is lower than 10%. Thus, mean value of both number of person consuming water in the household per day

[17] 14 out of 15 households were reported as having negative water consumption. This could be due to households not understanding the protocols (e.g., refilling buckets, or adding external water to the water filter), or measurement or recording error. One household reported zero water consumption for the 1st testing day because the users were not sure about the testing protocol and they decided not to use water from the filter for the 1st day but for the 2nd and 3rd testing day after understanding the protocol, they used the water filter as usual. For simplicity without losing its rigorous, this household was also excluded from the analysis.

and $Q_{p,y}$ are applied in the ER calculation. However, for $Q_{p,rawboil,y}$ and $Q_{p,cleanboil,y}$, with its margin of error at 90% level of confidence being higher than 10%, the upper limit value of $Q_{p,rawboil,y}$,(0.55 liter) and of $Q_{p,cleanboil,y}$ (0.03 litre) are used in the ER calculation instead of the mean value for conservativeness based on TPDDTEC 3.0. The details can be found in in section D4 and in the project study report.

	Number of households	Estimated mean value	Standard deviation	Standard error of mean	90% confidence interval: Lower limit	90% confidence interval: Upper limit	% margin of error at 90% level of confidence
Number of person consuming water in the household per day (mean)	125	5.23	2.46	0.22	4.87	5.60	6.96%
Filtered water consumed per person per day (mean litres)[18]	125	1.19	0.65	0.06	1.09	1.29	8.05%
Raw water boiled per person per day (mean litres)	125	0.46	0.59	0.05	0.37	0.55	18.97%
Filtered water boiled per person per day (mean litres)	125[19]	0.02	0.09	0.01	0.00	0.03	72.25%

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 is conducted using the 90/30 rule for selection of samples, accounting for variability in the types of 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.

For this monitoring period, based on the monitoring survey report (Table 24), there is no change for water boiling technologies from that of the baseline: wood and charcoal

[18] Excludes households with mean negative consumption or no consumption activity on a given day (n=15).
[19] Only 4 households reported boiling filtered water over the entire WCFT.

with traditional cookstove and or improved cookstove; and LPG with LPG stove. Thus, BWBT is not updated.

Ongoing monitoring studies: Usage rates, leakage, water quality and Hygiene survey

a) Usage rates

The usage survey will provide a single usage parameter that is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

The minimum total sample size is 100, with at least 30 samples for project technologies of each age being credited.

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".

For this monitoring period, the usage survey was conducted in December 2020 together with project survey and WCFT for 185 participants that purchased the project technology between 01 July 2015 and 30 June 2020 . More detail about the usage survey design and result could be found in section D4 and in the project study report.

b) Leakage

The project proponent will conduct a leakage investigation every two years using relevant survey methods that can be combined with monitoring surveys as is applicable.

For this monitoring period, leakage is estimated based on amount of wood used and diesel and gasoline consumption at the factory as detail in the ER calculation sheet, tab "leakage".

c) Water quality testing

Monitored parameters include the three volumetric parameters listed above, and also include the parameter of project water quality.
Based on the applied methodology TPDDTEC V3.0, water quality must be tested every quarter and the sample size calculation must follow the 90/10 precision rule. PP has developed the sampling water quality test protocol in which a minimum sample size must be 35 and the water samples are taken from the user households to an accredited laboratory (see the detail in sampling protocol for water quality[20]).

For this monitoring period, PP conducted the water quality test quarterly in March 2020, June 2020, Sep 2020 and Dec 2020. More detail about the WQT result could be found in the water quality test result and in section D below.

d) Hygiene campaign and survey

PP conducts a general hygiene campaign by attaching it to the sale meeting. PP will also conduct hygiene survey in addition to project and usage survey. The survey will ask to assess if the users have general hygienic knowledge or not especially on hand washing.

During this monitoring period, 113,246[21] people joined the hygiene campaign. The result of the hygiene survey could be found in the monitoring survey report.

The monitoring tasks undertaken continuously are:

Operation and maintenance of Ceramic Water Purifier (CWP)
As part of supporting CWP's operation and maintenance, the project includes brush for cleaning the ceramic pot together with CWP' s user manual in the purchased CWP' s kit. During the sale and hygiene campaign, the hygiene practice and operation and maintenance of CWPs are presented. Furthermore, the project introduced an after-sale service strategy in March 2018 where all field staffs have to do after-sale service including Credit Officer (CO), Clean Water Expert (CWE), Provincial Manager (PM). For example, CO has to check the condition of CWP and explain its operation and

[20] Sampling protocol for water quality test
[21] HSE-CP2MP3 Hygiene Campaign

maintenance from door to door when they come to collect the instalment from users who purchased CPW via loan.

Maintenance of a Total Sales Record

CWP units are sold to domestic and/or institutional end-users. Therefore, as applicable to this project, the Total Sales Record consist of a record of CWP units sold/distributed. The data included:

- Date of Sale
- Quantity of CWP units sold/distributed
- Model/type of CWP sold/distributed
- Invoice number
    - Geographic Area of Sale
    - Name and telephone number (if available) and address (if feasible)

Project Database

The project database is derived from the end-user warranty card where the contact details of end users are recorded. The contact details of end-users are 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.

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 are easily accessible for spot checking and cross referencing by a third party.

The contact information in the project database will allow a project auditor to easily contact and visit end users. Auditors are able to cross-check 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.

Quality control on monitoring survey is strictly monitored, either the survey done by a third party or by Project Proponent, a carbon consultant is hired to guide, advise and

check the work quality. The survey or field test must follow its sampling protocol/testing protocol. The workflow of monitoring survey and its quality control is well elaborated in the monitoring flow chart[22].

Double counting

As there are other ceramic 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.

[22] HSE_CP2MP3_ Monitoring_Flow

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data/parameter:	$f_{NRB,y}$
Unit	%
Description	Non-renewable biomass ratio
Source of data	CDM-SSCWG43-A04 (Information Note-Default values of fraction of non-renewable biomass for Cambodia, version 01.0)[23] CDM-EB-77 (Meeting report CDM Executive Board seventy-seventh meeting, version 01.0) Para 58, page 14)[24]
Value(s) applied	77.00%
Choice of data or Measurement methods and procedures	Default
Purpose of data	Calculation of baseline and project emissions
Additional comment	Ex ante physical survey by the project participant is not required as the data was publicly available by independent parties.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data/parameter:	$f_{ff,b,y}$
Unit	%
Description	Fraction of non-renewable fuel for fossil fuels (LPG)
Source of data	AMS III.AV Version 5

[23] https://cdm.unfccc.int/Panels/ssc_wg/index.html

[24] http://cdm.unfccc.int/EB/archives/meetings_14.html#77

Value(s) applied	100%
Choice of data or Measurement methods and procedures	Default
Purpose of data	Calculation of baseline and project emissions
Additional comment	

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
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	Default
Purpose of data	Baseline/Project emission calculations
Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$NCV_{b,LPG}$ / $NCV_{p,LPG}$
Unit	TJ/ton
Description	Net calorific value of the fuels used (LPG) in baseline/ project scenario
Source of data	IPCC (2006) "IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 1, Introduction, Table 1.2, p 1.18
Value(s) applied	0.047
Choice of data or Measurement methods and procedures	Default
Purpose of data	Baseline/Project emission calculations

Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	Wood to charcoal conversion factor
Unit	factor
Description	Wood to charcoal conversion factor
Source of data	AMS II.G "Energy efficiency measures in thermal applications of non-renewable biomass"
Value(s) applied	6
Choice of data or Measurement methods and procedures	Default
Purpose of data	Baseline/Project emission calculations
Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$EF_{b,wood,CO2}$ / $EF_{p,wood,CO2}$
Unit	tCO_2/TJ
Description	CO_2 emission factor arising from use of fuels (wood) in baseline/project scenario
Source of data used	IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	112.00
Choice of data or Measurement methods and procedures	Default
Purpose of data	Baseline/Project emission calculations
Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary,

	secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$
Unit	tCO_2e/TJ
Description	Non-CO_2 emission factor arising from use of fuels (wood) in baseline/project scenario
Source of data	- For wood emission CH4/N_2O: IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5 - For GWP: IPCC (2007) "IPCC Fourth Assessment Report: Climate Change 2007/ Climate Change 2007/ Working Group I: The Physical Science Basis 2.10.2 Direct Global Warming Potential" available at [last accessed 15-06-2015]: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
Value(s) applied	**8.69** = (Wood Emission Conversion Factor CH_4 * Global Warming Potential Equivalency of CH_4) + (Wood Emission Conversion Factor N_2O * Global Warming Potential Equivalency of N_2O) = (0.3*25) + (0.004*298) = 8.69
Choice of data or Measurement methods and procedures	Default
Purpose of data	Baseline/Project emission calculations
Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$EF_{b,LPG,CO2}$ / $EF_{p,LPG,CO2}$
Unit	tCO_2/TJ
Description	CO_2 emission factor arising from use of fuels (LPG) in baseline/project scenario
Source of data used	IPCC (2006) "IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5.
Value(s) applied	63.1

Choice of data or Measurement methods and procedures	Default
Purpose of data	Baseline/Project emission calculations
Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$EF_{b,LPG,nonCO2}$ / $EF_{p,LPG,nonCO2}$
Unit	tCO_2/TJ
Description	Non CO_2 emission factor arising from use of fuels (LPG) in baseline/project scenario
Source of data used	IPCC (2006) "IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Energy, Chapter 2, Stationary Combustion, Table 2.5
Value(s) applied	0.1548 ((CH_4=0.005*GWP 25) + (N_2O=0.0001*GWP 298)) This value is minimal which is negligible in the ER calculation. As a result, it is set to zero in the ER calculation for simplicity.
Choice of data or Measurement methods and procedures	Default
Purpose of data	Baseline/Project emission calculations
Additional comment	N/A

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
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	Baseline report and C_j & X_{boil} calculation sheet (Please refer HSE_CP2_C_j&X_{boil}_20171023).

Value(s) applied	5.80%
Choice of data or Measurement methods and procedures	Calculated
Purpose of data	Baseline/Project emission calculations
Additional comment	This value should be updated if ongoing monitoring surveys show that baseline water boiling changes overtime and the data is analyzed in the monitoring report.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
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 report and C_j & X_{boil} calculation sheet (Please refer HSE_CP2_Cj&Xboil_20171023).
Value(s) applied	25.97
Choice of data or Measurement methods and procedures	Calculated
Purpose of data	Calculation of baseline/project emissions

Additional comment	Ex ante physical survey by the project participant is not required as the data was publicly available by an independent parties.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	- $W_{b,y,TRAD,wood}$ - $W_{p,y,TRAD,wood}$
Unit	grams/liter
Description	- Quantity of wood required to treat 1 litre of water using traditional stoves in baseline scenario - Quantity of wood required to treat 1 litre of water using traditional stoves in project scenario
Source of data:	HSE(2019)_MonitoringSurvey_V6Final,Table 54
Value(s) of monitored parameter	- 300.38 - 300.38
Choice of data or Measurement methods and procedures	The Baseline Water Boiling Test is conducted to calculate the quantity of fuel required to get one liter of purified water[25] by boiling using technologies and fuels representative of the baseline scenario. The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "HSE(2019)_MonitoringSurvey_V6Final" and "HSE HH CP1MP7&CP2MP1 BWBT_Protocol_20190117_EN FINAL".
Purpose of data	Baseline/ Project emission calculations
Additional comment	Instead of using the mean value, the value of lower limit is applied due to the margin of error (36.45%) is greater than that of the tolerated value (30%) based on TPDDTEC 3.0, footnote 63, page 46. The value of this parameter should be updated if ongoing monitoring survey show that baseline water boiling change over time. B*ased on the monitoring survey report (Table 25), there is no change for water boiling technologies from that of the baseline:*

[25] Purified water by boiling is referred to water which is kept at its boiling point for 10 minutes, after reaching its boiling point.

	wood and charcoal with traditional cookstove and or improved cookstove; and LPG with LPG stove. Thus, BWBT is not updated.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	- $W_{b,y,TRAD,charcoal}$ - $W_{p,y,TRAD,charcoal}$
Unit	grams/liter
Description	- Charcoal required to treat 1 litre of water using traditional stoves in baseline scenario - Charcoal required to treat 1 litre of water using traditional stoves in project scenario
Source of data	HSE(2019)_MonitoringSurvey_V6Final,Table 54
Value(s) applied	- 144.5 - 144.5
Choice of data or Measurement methods and procedures	The Baseline Water Boiling Test is conducted to calculate the quantity of fuel required to get one liter of purified water[26] by boiling using technologies and fuels representative of the baseline scenario. The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "HSE(2019)_MonitoringSurvey_V6Final" and "HSE HH CP1MP7&CP2MP1 BWBT_Protocol_20190117_EN FINAL".
Purpose of data	Baseline/ Project emission calculations
Additional comment	NA

Relevant SDG Indicator	- SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	- $W_{b,y,IMP,Wood}$ - $W_{p,y,IMP,Wood}$
Unit	grams/liter

[26] Purified water by boiling is referred to water which is kept at its boiling point for 10 minutes, after reaching its boiling point.

Description	- Wood required to treat 1 litre of water using improved cook stove in baseline scenario - Wood required to treat 1 litre of water using improved cook stove in project scenario
Source of data	HSE(2019)_MonitoringSurvey_V6Final,Table 54
Value(s) applied	- 357.7 - 357.7
Choice of data or Measurement methods and procedures	The Baseline Water Boiling Test is conducted to calculate the quantity of fuel required to get one liter of purified water[27] by boiling using technologies and fuels representative of the baseline scenario. The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "HSE(2019)_MonitoringSurvey_V6Final" and "HSE HH CP1MP7&CP2MP1 BWBT_Protocol_20190117_EN FINAL".
Purpose of data	Baseline/ Project emission calculations
Additional comment	$W_{b,y,IMP,wood}$ (357.70g/liter) is greater than that of $W_{b,y,TRAD,wood}$ (300.38g/liter). Theoretically, it should be the opposite ($W_{b,y,TRAD,Wood} > W_{b,y,IMP,Wood}$). However, it is understood that the amount of consumed wood is very much depending on many factors including the type of kitchen (open air, semi open air, closed kitchen), the amount of water boil each time, the old of the stove …etc. Since in our test there is no control on these parameters (they are based on actual practice at each household); the result could be varying from the theoretical value.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	- $W_{b,y,IMP,Charcoal}$ - $W_{p,y,IMP,Charcoal}$
Unit	grams/liter
Description	- Charcoal required to treat 1 litre of water using improved cook stove in baseline scenario

[27] Purified water by boiling is referred to water which is kept at its boiling point for 10 minutes, after reaching its boiling point.

	- Charcoal required to treat 1 litre of water using improved cook stove in project scenario
Source of data	HSE(2019)_MonitoringSurvey_V6Final,Table 54
Value(s) applied	- 179.80 - 179.80
Choice of data or Measurement methods and procedures	The Baseline Water Boiling Test is conducted to calculate the quantity of fuel required to get one liter of purified water by boiling using technologies and fuels representative of the baseline scenario. The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "HSE(2019)_MonitoringSurvey_V6Final" and "HSE HH CP1MP7&CP2MP1 BWBT_Protocol_20190117_EN FINAL".
Purpose of data	Baseline/ Project emission calculations
Additional comment	$W_{b,y,IMP,Charcoal}$ (179.80g/liter) is greater than that of $W_{b,y,TRAD,Charcoal}$ (144.5g/liter). Theoretically, it should be the opposite ($W_{b,y,TRAD,Charcoal} > W_{b,y,IMP,Charcoal}$). However, it is understood that the amount of consumed charcoal is very much depending on many factors including the type of kitchen (open air, semi open air, closed kitchen), the amount of water boiled each time, the old of the stove …etc. Since in our test there is no control on these parameters (they are based on actual practice at each household); the result could be varying from the theoretical value.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	- $W_{b,y,LPG(small)}$ - $W_{p,y,LPG(small)}$
Unit	grams/liter
Description	- LPG required to treat 1 litre of water using LPG stove (small) in baseline scenario - LPG required to treat 1 litre of water using LPG stove (small) in project scenario
Source of data	HSE(2019)_MonitoringSurvey_V6Final,Table 54
Value(s) applied	- 31.2

	- 31.2
Choice of data or Measurement methods and procedures	The Baseline Water Boiling Test is conducted to calculate the quantity of fuel required to get one liter of purified water by boiling using technologies and fuels representative of the baseline scenario. The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "HSE(2019)_MonitoringSurvey_V6Final" and "HSE HH CP1MP7&CP2MP1 BWBT_Protocol_20190117_EN FINAL".
Purpose of data	Baseline/ Project emission calculations
Additional comment	NA

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	- $W_{b,y,LPG(Large)}$ - $W_{p,y,LPG(Large)}$
Unit	grams/liter
Description	- LPG required to treat 1 litre of water using LPG stove (large) in baseline scenario - LPG required to treat 1 litre of water using LPG stove (large) in project scenario.
Source of data	HSE_CP2-MP1_ER_Cal_V3.0_20190703, Tab: Core Data, Cell F55.
Value(s) applied	- 15.11 - 15.11
Choice of data or Measurement methods and procedures	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: $SEC = \left[WH \times \left(T_f - T_i\right) + 0.01 \times WHE\right] / n_{wb}$ (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 = 0.00001511 tonnes = **15.11 grams**
Purpose of data	Baseline/ Project emission calculations
Additional comment	As stated in the BWBT protocol, the test requires to weight the LPG container. So, it is not possible to do so because the container is attached to the stove and the user do not allow the survey team to detach it because they are afraid of leakage. Therefore, PP has used the value from the theorical calculation (15.00 grams/liter) which is more conservation than that of the field test (31.2 grams/liter).

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$W_{b,y,WEIGHTED,wood}$
Unit	Tonnes
Description	Wood used by technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test.

Source of data	Water Boiling Test and Baseline fuel mix
Value(s) applied	0.000211
Choice of data or Measurement methods and procedures	The formula used to reach this figure is: $W_{Wood\ required\ to\ boil\ 1\ litre\ of\ water\ with\ traditional.stove} * \%_{stove\ usage\ in\ baseline\ scenario}$ $+ W_{Wood\ required\ to\ boil\ 1\ litre\ of\ water\ with\ improved.stove} * \%_{stove\ usage\ in\ baseline\ scenario}$ $= W_{b,y,WEIGHTED,wood}$ *0.0003* 0.5693 + 0.000358 * 0.1126 = 0.000211 tonnes* *The percentage of stove usage in the baseline scenario is taken from the baseline survey.*
Purpose of data	Baseline/ Project emission calculations
Additional comment	

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	% of Traditional Stove Users with wood in the baseline
Unit	%
Description	Percentage of Traditional Stove Users with wood in the baseline
Source of data	- Baseline study - HSECP2_Baseline Stove-Fuel Mix Simplification20170921, Tab Final table ER Calc, Cell D7
Value(s) applied	56.93
Choice of data or Measurement methods and procedures	Result from the baseline study conducted in 2017
Purpose of data	Baseline emission calculations
Additional comment	NA

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	% of Improved Stove Users with wood in the baseline
Unit	%
Description	Percentage of Improved Stove Users with wood in the baseline
Source of data	- Baseline study

	- HSECP2_Baseline Stove-Fuel Mix Simplification20170921, Tab Final table ER Calc, Cell C7
Value(s) applied	11.26
Choice of data or Measurement methods and procedures	Result from the baseline study conducted in 2017
Purpose of data	Baseline emission calculations
Additional comment	NA

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$W_{b,y,WEIGHTED,charcoal}$
Unit	Tonnes
Description	Weighted Average of charcoal quantity in kg required to treat 1 litre of water using technologies representative of baseline scenario b during project year y
Source of data	Water Boiling Test and Baseline fuel mix
Value(s) applied	0.000009
Choice of data or Measurement methods and procedures	The formula used to reach this figure is: $W_{Charcoal\ required\ to\ boil\ 1\ litre\ of\ water\ with\ traditional.stove} * \%_{stove\ usage\ in\ baseline\ scenario} + W_{Charcoal\ required\ to\ boil\ 1\ litre\ of\ water\ with\ improved.stove} * \%_{stove\ usage\ in\ baseline\ scenario} = W_{b,y,WEIGHTED,charcoal}$ *0.0001445 * 0.0519 + 0.000179 * 0.0087 = 0.000009 tonnes* Note: the percentage of stove usage in the baseline scenario is taken from the baseline survey (HSECP2_Baseline Stove-Fuel Mix Simplification20170921, Tab Final Table ER Calc, Cell D8).
Purpose of data	Baseline/ Project emission calculations
Additional comment	

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	% of Traditional Stove Users with charcoal in the baseline
Unit	%

Description	Percentage of Traditional Stove Users with charcoal in the baseline
Source of data	- Baseline study - HSECP2_Baseline Stove-Fuel Mix Simplification20170921, Tab Final Table ER Calc, Cell D8
Value(s) applied	5.19
Choice of data or Measurement methods and procedures	Result from the baseline study conducted in 2017
Purpose of data	Baseline emission calculations
Additional comment	NA

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	% of Improved Stove Users with charcoal in the baseline
Unit	%
Description	Percentage of Improved Stove Users with charcoal in the baseline
Source of data	- Baseline study - HSECP2_Baseline Stove-Fuel Mix Simplification20170921, Tab Final Table ER Calc, Cell C8
Value(s) applied	0.87
Choice of data or Measurement methods and procedures	Result from the baseline study conducted in 2017
Purpose of data	Baseline emission calculations
Additional comment	NA

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$W_{b,y,WEIGHTED,LPG}$
Unit	Tonnes
Description	Average weighted quantity of LPG required to treat 1 litre of water using technologies representative of baseline scenario b during project year y
Source of data	Water Boiling Test and Baseline fuel mix

Value(s) applied	0.0000044
Choice of data or Measurement methods and procedures	The formula used to reach this figure is: *[$W_{LPG\ required\ to\ boil\ 1\ litre\ of\ water\ with\ Small\ LPG\ stove}$ * % of small $LPG_{stove\ usage\ in\ baseline\ scenario}$ + $W_{LPG\ required\ to\ boil\ 1\ litre\ of\ water\ with\ Large\ LPG\ stove}$ * % of Large $LPG_{stove\ usage\ in\ baseline\ scenario}$]*% of LPG stove usage in the baseline scenario = $W_{b,y,WEIGHTED,LPG}$* *[0.0000312 * 0.44 + 0.00001511 * 0.56]*0.1991 = 0.0000044 tonnes*
Purpose of data	Baseline/ Project emission calculations
Additional comment	Please note that the share of *small LPG stove and that of Large LPG stove* usage in the baseline scenario were not anticipated in the baseline survey. All LPG users were considered as only one type of LPG stove user in the baseline survey. However, due to the complexity of conducting the water boiling test with LPG large stove, PP could conduct the test for only small LPG stove type as explain in the above $W_{b,y,LPG(Large)}$ section. During this monitoring survey, the share of small and large LPG stove was estimated. This share is used for baseline scenario. This is considered as a conservative approach because it is understood that the share of household using large LPG stove in the actual baseline scenario is smaller than that of the project scenario. It is believed that the share of large LPG stove use is proportional to the better household economic status. With the average GDP growth rate of 7.6 % for the last decade (https://www.worldbank.org/en/country/cambodia), the household socio-economic is also expected to be better year by year.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter	*% of LPG stove usage in the baseline scenario*
Unit	%
Description	Percentage of *LPG stove in baseline scenario*
Source of data	- Baseline survey - HSECP2_Baseline Stove-Fuel Mix Simplification20170921, Tab Final Table ER Calc, Cell C9

Value(s) applied	19.91
Choice of data or Measurement methods and procedures	Result from the baseline survey conducted in 2017
Purpose of data	Baseline emission calculations
Additional comment	NA

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	*% of small LPG$_{stove\ usage\ in\ baseline\ scenario}$*
Unit	%
Description	Percentage of *small LPG stove usage in baseline scenario*
Source of data	- HSE(2019)_MonitoringSurvey_V6Final, page 37
Value(s) applied	44
Choice of data or Measurement methods and procedures	Result from the monitoring survey conducted in 2019
Purpose of data	Baseline emission calculations
Additional comment	Please note that the share of *small LPG stove and that of Large LPG stove* usage in the baseline scenario were not anticipated in the baseline survey. All LPG users were considered as only one type of LPG stove user in the baseline survey. However, due to the complexity of conducting the water boiling test with LPG large stove, PP could conduct the test for only small LPG stove type as explain in the above $W_{b,y,LPG(Large)}$ section. During this monitoring survey, the share of small and large LPG stove was estimated. This share is used for baseline scenario. This is considered as a conservative approach because it is understood that the share of household using large LPG stove in the actual baseline scenario is smaller than that of the project scenario. It is believed that the share of large LPG stove use is proportional to the better household economic status. With the average GDP growth rate of 7.6 % for the last decade (https://www.worldbank.org/en/country/cambodia), the household socio-economic is also expected to be better year by year.

Relevant SDG Indicator	SDG13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	*% of large LPG$_{stove\ usage\ in\ baseline\ scenario}$*
Unit	%
Description	Percentage of large *LPG stove usage in baseline scenario*
Source of data	HSE(2019)_MonitoringSurvey_V6Final, page 37
Value(s) applied	56
Choice of data or Measurement methods and procedures	Result from the monitoring survey conducted in 2019
Purpose of data	Baseline emission calculations
Additional comment	Please note that the share of *small LPG stove and that of Large LPG stove* usage in the baseline scenario were not anticipated in the baseline survey. All LPG users were considered as only one type of LPG stove user in the baseline survey. However, due to the complexity of conducting the water boiling test with LPG large stove, PP could conduct the test for only small LPG stove type as explained in the above $W_{b,y,LPG(Large)}$ section. During this monitoring survey, the share of small and large LPG stove was estimated. This share is used for baseline scenario. This is considered as a conservative approach because it is understood that the share of household using large LPG stove in the actual baseline scenario is smaller than that of the project scenario. It is believed that the share of large LPG stove use is proportional to the better household economic status. With the average GDP growth rate of 7.6 % for the last decade (https://www.worldbank.org/en/country/cambodia), the household socio-economic is also expected to be better year by year.

Relevant SDG Indicator	SDG15.1.1 Forest area as a proportion of total land area.
Data / Parameter:	Growth stock in forest
Unit	Tonne/Hectare

Description	Growth stock in forest in Cambodia
Source of data	- Cambodia growing stock (94m^3/ha): Global Forest Resources Assessment 2015, Page 79, Table 13 Growing stock in forest and other wooded land 2015 - Converting factor from m^3 of wood to tonne (1.725 tonne/m^3): Chapter 3: LUCF sector Good Practice Guidance IPCC 2006, page 12
Value(s) applied	162.15
Choice of data or Measurement methods and procedures	= Cambodia growth stock in forest (m^3/ha) * Converting factor from m^3 of wood to tonne of wood. = 94 m^3/ha*1.725 tonne/m^3=162.15 tonne/hectare
Purpose of data	Calculation of baseline and project emissions
Additional comment	

D.2. Data and parameters monitored

Relevant SDG Indicator	- SDG 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - SDG 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$T_{p,y}$
Unit	CWPs
Description	Total distributed water purifier (CWP) units
Measured/calculated/default	Recorded
Source of data	Sales Records and ER spread sheet "tab Units_month, sum (E6:E126)"
Value(s) of monitored parameter	- 33,746 units (number of units sold during CP2-MP3 monitoring period, 01 Jan-31 Dec 2020) - 452,251 units (cumulative units sold up to 31 Dec 2020)
Monitoring equipment	Data record
Measuring/reading/recording frequency:	Monthly
Calculation method (if applicable):	N/A
QA/QC procedures:	Data comes from 3 sales channels: direct, retail, and NGO sales. The finance department ensures that all sales numbers are accurate by reconciling sales data with payments, and entering the sales into their accounting system, Peachtree. The Carbon Project Officer at Nexus verifies those monthly sales data and enters them into the ER spreadsheet. See "HSE_CP2MP3_Sales_Database" for the summary sales per

	month. All sales data are available on request to the VVB. Also, see "HSE_CP2MP3_ Monitoring_Flow"
Purpose of data:	Baseline/Project emissions calculations
Additional comment:	N/A

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 6.1.1 Proportion of population using safely managed drinking water services. The number of people with access to safe drinking water is the monitored parameter. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter
Data / Parameter:	$U_{p,y}$
Unit	%
Description	Weighted average usage rate
Measured/calculated/default	Calculated
Source of data	Monitoring survey report and ER spread sheet tab "Usage Rate Calc".
Value(s) of monitored parameter	83.18
Monitoring equipment	Survey questionnaire and observation
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	Weighted average usage rate is calculated based on usage rate of each age group and its corresponding sale. The detail calculation can be found in ER spread sheet tab "Usage Rate Calc".
QA/QC procedures:	The survey was carried out by a third-party (Angkor Research and Consulting). The data were collected by using a computer-

	assisted personal interview (CAPI) developed by the World Bank and the data quality control was made both at field and office. The final dataset was cleaned by the research consultant before analyzing. It should be noted that all the data was recorded and analyzed in SPSS (statistic software). Then the raw data was exported into Excel spreadsheet for any further analysis if needed.
Purpose of data:	Baseline and project emission calculations
Additional comments:	N/A

Relevant SDG Indicator	- 3.9.1 Mortality rate attributed to household and ambient air pollution. The number of people who notice less smoke in kitchen after having water filter is the monitored parameter. - 6.1.1 Proportion of population using safely managed drinking water services. The number of people with access to safe drinking water is the monitored parameter. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter
Data / Parameter:	$WQ_{Passed,y}$
Unit	%
Description	Water quality passing rate of water quality standard (WHO standard) per year
Measured/calculated/default	Calculated
Source of data	Water Quality test results
Value(s) of monitored parameters	90.00
Monitoring equipment	Laboratory test
Measuring/reading/recording frequency:	Quarterly
Calculation method (if applicable):	NA

QA/QC procedures:	PP has contracted a 3rd party -consulting company to develop a sampling protocol [28] . Following this protocol, PP has conducted water quality test survey at the end-user point by taking the water sample at the point of use from the household to a 3rd party laboratory (Institut Pasteur du Cambodge[29]). The result from the four water quality surveys showed that in average 90.00%[30] of surveyed households' water quality pass WHO standard for drinking water (E.Coli <1 per 100ml). The four water quality surveys were conducted on quarterly base: March 2020, June 2020, Sep 2020 and Dec 2020.
Purpose of data:	Baseline/Project emission calculations
Additional comment:	

Relevant SDG Indicator	- 3.9.1 Mortality rate attributed to household and ambient air pollution. The number of people who notice less smoke in kitchen after having water filter is the monitored parameter. - 6.1.1 Proportion of population using safely managed drinking water services. The number of people with access to safe drinking water is the monitored parameter. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter
Data / Parameter:	Hygiene Campaigns
Unit	Number of people
Description	Number of people attends the meeting in which Hygiene issue were explained
Measured/calculated/default	Records
Source of data	Record from meetings "HSE-CP2MP3 Hygiene Campaign"
Value(s) of monitored parameter	113,246
Monitoring equipment	NA

[28] HSE_CP2-MP3_WQ_protocol

[29] http://www.pasteur-kh.org/

[30] HSE_CP2-MP3_Water_Quality_Result

Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	Records
QA/QC procedures:	Data are coming from the attendant list of the people attending the meeting
Purpose of data:	Monitoring on the hygiene activities
Additional comment:	

Relevant SDG Indicator	- 3.9.1 Mortality rate attributed to household and ambient air pollution. The number of people who notice less smoke in kitchen after having water filter is the monitored parameter. - 6.1.1 Proportion of population using safely managed drinking water services. The number of people with access to safe drinking water is the monitored parameter. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$N_{p,y}$
Unit	Persons.days
Description	Number of person.days consuming water supplied by project scenario p through year y.
Measured/calculated/default	Calculated
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	1,914.18
Monitoring equipment	Questionnaire and testing
Measuring/reading/recording frequency:	Before first verification of each crediting period and every two years for the sequential monitoring period
Calculation method (if applicable):	Total of person.days = number of days in use (366) * number of units per household (1) * number of persons consuming water per household per day (5.23) = 1,914.18 person.days.
QA/QC procedures:	Data collected during the tests were collected over a four-day period, this information was recorded on the tablet-base data collection systems. Following the encoding process, the

	analysis was led by experienced consultant and the final results was then validated by the Carbon Project Manager at Nexus. See "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, page 36-37". Raw data is available on request to the VVB.
Purpose of data:	Calculation of baseline/project emission
Additional comment:	

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameter were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	$Q_{p,y}$
Unit	Litres/person/day
Description	Quantity of purified water consumed in the project scenario p per person per day
Measured/calculated/default	Measured
Source of data	Water Consumption Field Test (WCFT)
Value(s) of monitored parameter	1.19
Monitoring equipment	Analog scale is used to weight the water consumption per day. The verification of calibration of scale was conducted by checking its accuracy against the standard weight. Only scale that passed this verification are utilized in the test. The details of this scale's verification can be found in "ARC_Hydrologic Calibration&Inventory_2020_EN".

Measuring/Reading/ Recording frequency:	Before first verification of each crediting period and every two years for the sequential monitoring period
Calculation method (if applicable):	The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean" and "HSE_CP2MP3_WCFT_Protocol_EN_FINAL".
QA/QC procedures:	Data collected during the tests were collected over a four-day period, this information was recorded on the tablet-base data collection systems. Following the encoding process, the analysis was led by experienced consultant and the final results was then validated by the Carbon Project Manager at Nexus. See "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 38". Raw data is available on request to the VVB.
Purpose of data:	Calculation of ER.
Additional comment;	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	$Q_{p,rawboil,y}$
Unit	Litres/person/day
Description	The raw or unsafe water that is still boiled after installation of the CWP
Measured/calculated/default	Measured
Source of data	Water Consumption Field Test (WCFT)

Value(s) of monitored parameter	0.55
Monitoring equipment	Analog scale is used to weight the water consumption per day. The verification of calibration of scale was conducted by checking its accuracy against the standard weight. Only scale that passed this verification are utilized in the test. The details of this scale's verification can be found in "ARC_Hydrologic Calibration&Inventory_2020_EN".
Measuring/reading/recording frequency:	Before first verification of each crediting period and every two years for the sequential monitoring period
Calculation method (if applicable):	The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean" and "HSE_CP2MP3_WCFT_Protocol_EN_FINAL".
QA/QC procedures:	Data collected during the tests were collected over a four-day period, this information was recorded on the tablet-base data collection systems. Following the encoding process, the analysis was led by experienced consultant and the final results was then validated by the Carbon Project Manager at Nexus. See "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 38". Raw data is available on request to the VVB.
Purpose of data:	Calculation of ER.
Additional comment:	Due to the margin of error (18.97%) is greater than 10% (90/10 rule), the upper limit value (0.55 liter) is used instead of mean value (0.46 liter) for conservativeness as stated in TPDDTEC V3.0, footnote 21.

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology.

	- 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	$Q_{p,cleanboil,y}$
Unit	Litres/person/day
Description	Quantity of safe water (treated or from safe supply) boiled in the project scenario p, after installation of the CWP
Measured/calculated/default	Measured/calculated
Source of data	Water Consumption Field Test (WCFT), "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean "
Value(s) of monitored applied	0.03
Monitoring equipment	Analog scale is used to weight the water consumption per day. The verification of calibration of scale was conducted by checking its accuracy against the standard weight. Only scale that passed this verification are utilized in the test. The details of this scale's verification can be found in "ARC_Hydrologic Calibration&Inventory_2020_EN".
Measuring/Reading/ Recording frequency:	Before first verification of each crediting period and every two years for the sequential monitoring period.
Calculation method (if applicable):	The calculations are completed by third-party consulting company (Angkor Research: http://angkorresearch.com/?page=front&lg=en), as explained in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean" and "HSE_CP2MP3_WCFT_Protocol_EN_FINAL".
QA/QC procedures:	Data collected during the tests were collected over a four-day period, this information was recorded on the tablet-base data collection systems. Following the encoding process, the analysis was led by experienced consultant and the final results was then validated by the Carbon Project Manager at Nexus. See "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 38". Raw data is available on request to the VVB.
Purpose of data:	Calculation of ER.

Additional comment:	Due to the margin of error (72.25%) is greater than 10% (90/10 rule), the upper limit value (0.03 liter) is used instead of mean value (0.02 liter) for conservativeness as stated in TPDDTEC V3.0, footnote 21.

Relevant SDG Indicator	5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location. The number of women and girls benefiting from stop/reducing boiling water and collecting/purchasing cooking fuel is the monitored parameter.
Data / Parameter:	Women%_HH
Unit	Percentage
Description	Average percentage of women and girls per household who use CWP
Measured/Calculated/Default	Measured
Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 3
Value(s) of monitored parameter	56.25
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Results of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	To estimate SDG5 contribution
Additional comment:	

Relevant SDG Indicator	5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location. The number of women and girls benefiting from stop/reducing boiling water and collecting/purchasing cooking fuel is the monitored parameter.
Data / Parameter:	Women%

Unit	Percentage
Description	Average percentage of women and girls responsible for water boiling and collecting/purchasing cooking fuel before having CWPs
Measured/Calculated/Default	Measured
Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 25"
Value(s) applied	81.65
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Based on the result from the monitoring survey, Women% = Average [% women and girls responsible for water boiling (92.3%), % women and girls responsible for collecting/purchasing cooking fuel (71.0%)] = 81.65%
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	To estimate SDG5 contribution
Additional comment:	

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution. The number of people who notice less smoke in kitchen after having water filter is the monitored parameter
Data / Parameter:	$N_{Less\_smoke,y}$
Unit	%
Description	% of households notice that their kitchen is less smoke
Measured/Calculated/Default	Measured
Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 32"

Value(s) of monitored parameter	75.9
Monitoring equipment	Questionnaire
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	To estimate SDG3 contribution
Additional comment:	

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of Traditional Stove Users with wood in the project scenario
Unit	%
Description	Percentage of Traditional Stove Users with wood in the project scenario
Measured/Calculated/Default	Measured/calculated
Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 24"
Value(s) of monitored parameter	44.10

Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency:	Annually
Calculation method (if applicable):	For simplicity and conservativeness, percentage of 3-stone stove user with wood and concrete stove users with wood in the project scenario is included in the % of traditional stove users with wood in the project scenario. = % 3-stone stove users with wood in the project scenario (1.20%) + concrete stove users with wood in the project scenario (2.40%)+ % traditional stove users with wood in the project scenario (40.50%) = 44.10%
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of Improved Stove Users with wood in the project scenario
Unit	%
Description	Percentage of Improved Stove Users with wood in the project scenario
Measured/Calculated/Default	Measured

Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 24"
Value(s) applied	13.10
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of Traditional Stove Users with charcoal in the project scenario
Unit	%
Description	Percentage of Traditional Stove Users with charcoal in the project scenario
Measured/Calculated/Default	Measured
Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_ V8_Clean, Table 24"

Value(s) of monitored parameter	0.00
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of Improved Stove Users with charcoal in the project scenario
Unit	%
Measured/Calculated/Default	Measured
Description	Percentage of Improved Stove Users with charcoal in the project scenario
Source of data	Monitoring survey "ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 24"

Value(s) of monitored parameter	1.20
Monitoring equipment	Questionnaire
Measuring/Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of LPG stove usage in the project scenario
Unit	%
Description	Percentage of LPG stove usage in the project scenario
Measured/Calculated/Default	Measured
Source of data	Monitoring survey " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 24"
Value(s) of monitored parameter	26.20
Monitoring equipment	Questionnaire

Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of Small LPG stove usage in the project scenario
Unit	%
Description	Percentage of small LPG stove usage in the project scenario
Measured/Calculated/Default	Measured
Source of data	Monitoring survey " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, page 30"
Value(s) of monitored parameter	9.10
Monitoring equipment	Questionnaire
Measuring/Reading/Recording frequency:	Annually

Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	- 1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology. - 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter. - 15.1.1 Forest area as a proportion of total land area. Area of forest save is the monitored parameter.
Data / Parameter:	% of Large LPG stove usage in the project scenario
Unit	%
Description	Percentage of large LPG stove usage in the project scenario
Measured/Calculated/Default	Measured
Source of data	Monitoring survey " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, page 30"
Value(s) of monitored parameter	90.90
Monitoring equipment	Questionnaire
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey

QA/QC procedures:	Monitoring survey was conducted in line with the registered methodology. The detail of the survey could be found in " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean". Also, see "HSE_CP2MP3_ Monitoring_Flow" for the monitoring survey and its quality control flow chart.
Purpose of data:	Calculation of ER.
Additional comment:	NA

Relevant SDG Indicator	13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	$LE_{p,y}$
Unit	tCO_2e/Unit
Description	Leakage emissions for project scenario p during year y
Measured/Calculated/Default	Measured/Calculated
Source of data	Source of data for the following parameter are provided as following: - Leakage emissions: ER spreadsheet, Tab: Leakage, Cell D16 - Firewood Use at Factory: HSE_CP2_MP3_Wood&Diesel_Purchase - Weight of wood per m^3: Hydrologic (2011) Summary data of weighing firewood 2012-09-12 Carbon content in wood: IPCC (2006) "IPCC Guidelines for National Greenhouse Gas Inventories", Chapter 12, Harvested Wood Products, Table 12.4, p.12.19. The value for temperate and tropical wood species was selected because 100% of Cambodia's forests are tropical forests (see http://rainforests.mongabay.com/deforestation/archive/Cambodia.htm)
Value(s) of monitored parameter	0.012
Monitoring equipment	Record
Measuring/Reading/Recording frequency:	Every two years

Calculation method (if applicable):	Leakage = Weight of wood per m^3 * Quantity of wood purchased for factory * Carbon content in wood* f_{NRB} * (molecular weight of CO_2/molecular weight of Carbon) / conversion from kg to tonnes / number of units sold 289.72 kg per m^3 * 996.50m^3 * 0.50 *0.77 * (44.00/12.00) / 1000 / 33,746 units = 0.012 tCO_2e/unit
QA/QC procedures:	The cubic meters of firewood in each truck load of wood purchased is recorded in every receipt. The finance department verifies the receipts and enters the amount of wood into the accounting system. The Carbon Project Officer at Nexus spot checks the receipts and validates the spreadsheets. See " HSE_CP2_MP3_Wood&Diesel_Purchase".
Purpose of data:	Calculation of ER.
Additional comment:	1. The PP also tracks diesel and gasoline used to power generators for electricity and other activities at the factory, however these emissions were determined to be immaterial as they represent 0.036% of the emission reductions achieved in the monitoring period. In this monitoring period, the PP purchased 10,400 liters of Diesel and 210 liters of gasoline, as shown in "HSE_CP2_MP3_Wood&Diesel_Purchase". Total emission from using these fuel was estimated to be 28.48 tCO_2e (28.00 tCO_2e from diesel and 0.48 tCO_2e from gasoline) tCO_2 from Diesel = Liters of Diesel (L) * Density of Diesel (kg/L) / 1000 (kg to tonnes) * Net Calorific Value of Diesel (GJ/tonne) * Emission Factor of Diesel (tCO_2/GJ) 10,400 L * 0.84 kg/L / 1,000,000 (kg to Gg) * 43 TJ/Gg * 74.53 tCO_2/TJ = 32.30 tCO_2 tCO_2 from Gasoline = Liters of Gasoline (L) * Density of Gasoline (kg/L) / 1,000,000 (kg to Gg) * Net Calorific Value of Gasoline (TJ/Gg) * Emission Factor of Gasoline (tCO_2/TJ). 210 L * 0.74 kg/L / 1000000 (kg to Gg) * 44.3 TJ/Gg * 69.73 tCO_2/TJ = 0.68 tCO_2 Total emission from diesel and gasoline = 28.00 tCO_2 + 0.48 tCO_2 = 28.48 tCO_2

	Percentage of Emission Reductions (%) = Emissions from fuel Diesel and Gasoline / Emission Reductions in the Monitoring Period 28.48 tCO_2 / 93,615.62 tCO_2e = 0.03% The PDD specifies that the PP shall monitor Leakage using "monitoring surveys", as specified in the PDD. For this methodology, this refers to the project activity replacing a lower emissions method of water treatment. While the project activity is a zero-emissions solution, the PP still asked end-users in the Project Survey if they had been treating water, what treatment method they used. Of those who treated water, 90.0% were boiling water and 7.7% were using some other type of filtration technique, as shown in " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 21 ". The PP has therefore concluded that it has not replaced a lower emitting device, and that it does not need to assess this form of leakage.

Relevant SDG Indicator	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology.
Data / Parameter:	Net benefit (a) of SDG1
Unit	tonne
Description	Total amount of biomass fuel saves
Measured/Calculated/Default	Calculated
Source of data	Calculated in ER spreadsheet, Tab: Nexus_Summary, cell AJ9
Value(s) of monitored parameter	65,540
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method

QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG1 contribution
Additional comment:	

Relevant SDG Indicator	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology.
Data / Parameter:	Net benefit (b) of SDG1
Unit	tonne
Description	Total amount of LPG saves
Measured/Calculated/Default	Calculated
Source of data	Calculated in ER spreadsheet, Tab: Nexus_Summary, cell AK9
Value(s) of monitored parameter	956
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG1 contribution
Additional comment:	

Relevant SDG Indicator	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and

	Percentage of household noted on time save after using the project technology.
Data / Parameter:	Net benefit (c) of SDG1
Unit	%
Description	Percentage of household noted on money save after using the project technology
Measured/Calculated/Default	Measured
Source of data	Monitoring survey " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 33"
Value(s) of monitored parameter	82.10
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Result of the survey
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG1 contribution
Additional comment:	N/A

Relevant SDG Indicator	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural). Three parameters were selected to be monitored for this indicator: - The amount of fuel save, Percentage of household noted on money save and Percentage of household noted on time save after using the project technology.
Data / Parameter:	Net benefit (d) of SDG1
Unit	%
Description	Percentage of household noted on time save after using the project technology
Measured/Calculated/Default	Measured/calculated
Source of data	Monitoring survey " ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, Table 32 and Table 34"

Value(s) of monitored parameter	91.20
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	= (%HH saved time from boiling water (94.8%) +%HH saved time from avoiding collecting or purchasing fuel (87.6%)/2 = 91.20%
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG1 contribution
Additional comment:	N/A

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution. The number of people who notice less smoke in kitchen after having water filter is the monitored parameter
Data / Parameter:	Net benefits of SDG3
Unit	People
Description	Number of people using CWP and note that their kitchen is less smoke
Measured/Calculated/Default	Measured/calculated
Source of data	Calculated, ER spreadsheet, Tab: Nexus_Summary, cell AN9
Value(s) of monitored parameter	566,367
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2, E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG3 contribution
Additional comment:	

Relevant SDG Indicator	5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location. The number of women and girls benefiting from stop/reducing boiling water and collecting/purchasing cooking fuel is the monitored parameter.
Data / Parameter:	Net benefits of SDG5
Unit	People
Description	The number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel.
Measured/Calculated/Default	Measured/Calculated
Source of data	Calculated, ER spreadsheet, Tab: Nexus_Summary, cell AO9
Value(s) of monitored parameter	253,713
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG5 contribution
Additional comment:	

Relevant SDG Indicator	6.1.1 Proportion of population using safely managed drinking water services. The number of people with access to safe drinking water is the monitored parameter.
Data / Parameter:	Net benefits of SDG6
Unit	People
Description	Number of people with access to safe drinking water
Measured/Calculated/Default	Calculated
Source of data	Calculated, ER spreadsheet, Tab: Nexus_Summary, cell AP9
Value(s) of monitored parameter	746,201
Monitoring equipment	Survey and calculation

Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG6 contribution
Additional comment:	

Relevant SDG Indicator	7.1.2 Proportion of population with primary reliance on clean fuels and technology. Amount of energy saves from avoiding boiling water under the project activity is the monitored parameter.
Data / Parameter:	Net benefits of SDG7
Unit	TJ
Description	Amount of energy saved from avoiding boiling water
Measured/Calculated/Default	Calculated
Source of data	Calculated, ER spreadsheet, Tab: Nexus_Summary, cell AQ9
Value(s) of monitored parameter	1,028
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG7 contribution
Additional comment:	

Relevant SDG Indicator	8.5.1 Average hourly earnings of female and male employees, by occupation, age and persons with disabilities. The number of new job created by the project with safe and healthy work environment is the monitored parameter.

Data / Parameter:	Net benefit of SDG8
Unit	staff
Description	Number of new job created by the project with safe and healthy work environment
Measured/Calculated/Default	Measured
Source of data	Staff report "HSE_CP2-MP3_Em&Inc2020"
Value(s) of monitored parameter	85
Monitoring equipment	Record
Measuring/Reading/Recording frequency:	At least every two year
Calculation method (if applicable):	PP is monitoring and recording number of the employed staff
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To define SDG8's contribution
Additional comment:	The average monthly income of hydrologic staff is greater or equal to the Cambodian minimum wage of 190 USD as detail in "HSE_CP2-MP3_Em&Inc2020".

Relevant SDG Indicator	- 13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula. The total amount of emission reduction is the monitored parameter.
Data / Parameter:	Net benefits of SDG13
Unit	tCO_2e
Description	Amount of ER
Measured/Calculated/Default	Calculated
Source of data	Calculated, ER spreadsheet, Tab: Nexus_Summary, cell F9
Value(s) of monitored parameter	93,878
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually

Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analyzed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG13 contribution
Additional comment:	

Relevant SDG Indicator	15.1.1 Forest area as a proportion of total land area. The area of forest save is monitored indicator.
Data / Parameter:	Net benefits of SDG15
Unit	Hectare
Description	Area of forest save
Measured/Calculated/Default	Calculated
Source of data	Calculated, ER spreadsheet, Tab: Nexus_Summary, cell AT9
Value(s) of monitored parameter	404
Monitoring equipment	Survey and calculation
Measuring/Reading/Recording frequency:	Annually
Calculation method (if applicable):	Please refer to section E1, E2 and E3 for the detail calculation method
QA/QC procedures:	Transparent data analysis and reporting. The data is analysed in the monitoring report and raw data is available on request to the VVB.
Purpose of data:	To estimate SDG15 contribution
Additional comment:	

D.3. Comparison of monitored parameters with last monitoring period

No	Description	Parameter	Unit	Value obtained in (CP2-MP3)	Value obtained (CP2-MP2)	Remarks on any significant different
1	Total distributed water purifier	$T_{p,y}$	CWP	33,746.00	35,061.00	The lower sale in this MP may be due to Covid 19 pandemic which limit sale activity on the ground.
2	Weighted average usage rate	$U_{p,y}$	Percentage	83.18%	82.62%	The usage rate in this MP is slightly higher than that of the previous MP.
3	Water quality passing rate	$WQ_{Passed,y}$	Percentage	90.00%	90.56%	The water quality passing rate in this MP is slightly lower than that of the previous MP.
4	Number of people attending hygiene meeting	Hygiene Campaigns	People	113,246.00	91,764	More people attended hygiene meeting perhaps they are more interested in hygiene matter due to CoVid 19.
5	Number of person.days consuming water supplied by project scenario p through year y	$N_{p,y}$	People	1,914.18	1,741.05	Latest WCFT showed that the number of person per HH is higher than that applied in previous MP being 5.23 and 4.77 person per day per household respectively. This might be due to more people are back to their home town due to pandemic CoViD 19.
6	Quantity of purified water consumed in the project scenario p per person per day	$Q_{p,y}$	Litres/person/day	1.19	1.46	Latest WCFT showed that the $Q_{p,y}$ is lower than that applied in previous MP.

No	Description	Parameter	Unit	Value obtained in (CP2-MP3)	Value obtained (CP2-MP2)	Remarks on any significant different
7	The raw or unsafe water that is still boiled after installation of the CWP	$Q_{p,rawboil,y}$	Litres/person/day	0.55	0.48	Latest WCFT showed that the $Q_{p,rawboil,y}$ is slightly higher than that applied in previous MP.
8	Quantity of safe water (treated or from safe supply) boiled in the project scenario p, after installation of the CWP	$Q_{p,cleanboil,y}$	Litres/person/day	0.03	0.15	Latest WCFT showed that the $Q_{p,cleanboil,y}$ is lower than that applied in previous MP.
9	Average percentage of women and girls per household who use CWP	Women%_HH	Percentage	56.25%	54.34%	Based on the monitoring survey, Women%_HH in this MP is slightly higher than that of previous MP.
10	Average percentage of women and girls responsible for water boiling and collecting/purchasing cooking fuel before having CWPs	Women%	Percentage	81.65%	84.15%	Based on the monitoring survey, Women% in this MP is lower than that of previous MP.
11	% of households notice that their kitchen is less smoke	$N_{Less\_smoke,y}$	Percentage	75.90%	74.00%	Based on the monitoring survey, $N_{Less\_smoke,y}$ in this MP is slightly higher than that of previous MP.
12	Percentage of Traditional Stove Users with wood in the project scenario		Percentage	44.10%	53.90%	Based on the monitoring survey, percentage of traditional stove user with wood in the project scenario in this MP is lower than that of previous MP.
13	Percentage of Improved Stove Users with wood in the project scenario		Percentage	13.10%	18.50%	Based on the monitoring survey, percentage of improved stove user with wood in the project scenario in this MP is lower than that of previous MP.
14	Percentage of Traditional Stove Users with charcoal in the project scenario		Percentage	0.00%	1.50%	Based on the monitoring survey, percentage of traditional stove user with charcoal in the project scenario in this MP is lower than that of previous MP.

No	Description	Parameter	Unit	Value obtained in (CP2-MP3)	Value obtained (CP2-MP2)	Remarks on any significant different
15	Percentage of Improved Stove Users with charcoal in the project scenario		Percentage	1.20%	1.50%	Based on the monitoring survey, percentage of improved stove user with charcoal in the project scenario in this MP is lower than that of previous MP.
16	Percentage of LPG stove usage in the project scenario		Percentage	26.20%	20.00%	Based on the monitoring survey, percentage of LPG stove usage in the project scenario in this MP is higher than that of previous MP. This may be due to expansion of LPG stove market in Cambodia rural areas.
17	Percentage of small LPG stove usage in the project scenario		Percentage	9.10%	38.50%	Based on the monitoring survey, percentage of small LPG stove usage in the project scenario in this MP is lower than that of previous MP. This may be due to expansion of large LPG stove market in Cambodia rural areas.
18	Percentage of large LPG stove usage in the project scenario		Percentage	90.90%	61.50%	Based on the monitoring survey, percentage of large LPG stove usage in the project scenario in this MP is higher than that of previous MP. This may be due to expansion of large LPG stove market in Cambodia rural areas.
19	Leakage emissions for project scenario p during year y	$LE_{p,y}$	tCO_2e/Unit	0.012	0.014	$LE_{p,y}$ in this MP is slightly lower than that of the previous one. This might be due less production activity at the factory due to impact of Covid 19.
20	Total amount of biomass fuel saves	Net benefit (a) of SDG1	tonne	65,540.00	63,697.00	Net benefit (a) of SDG 1 in this monitoring period is slightly higher than that of previous MP due to different and higher value of parameters applied, especially number of person.days consuming water supplied by project scenario p through year y.
21	Total amount of LPG saves	Net benefit (b) of SDG1	tonne	956.00	1,062.00	Net benefit (b) of SDG 1 in this monitoring period is slightly lower than that of previous MP because more people use large LPG stove compared to previous MP.

No	Description	Parameter	Unit	Value obtained in (CP2-MP3)	Value obtained (CP2-MP2)	Remarks on any significant different
22	Percentage of household noted on money save after using the project technology	Net benefit (c) of SDG1	Percentage	82.1%	80.70%	Net benefit (c) of SDG 1 in this monitoring period is slightly higher than that of previous MP.
23	Percentage of household noted on time save after using the project technology	Net benefit (d) of SDG1	Percentage	91.2%	90.65%	Net benefit (d) of SDG 1 in this monitoring period is slightly higher than that of previous MP.
24	Number of people using CWP and note that their kitchen is less smoke	Net benefits of SDG3	People	566,366.63	538,933.77	Net benefit of SDG 3 in this monitoring period is slightly higher than that of previous MP.
25	The number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel	Net benefits of SDG5	People	253,712.78	246,538.75	Net benefit of SDG 5 in this monitoring period is slightly higher than that of previous MP.
26	Number of people with access to safe drinking water	Net benefits of SDG6	People	746,201.09	728,288.88	Net benefit of SDG 6 in this monitoring period is slightly higher than that of previous MP.
27	Amount of energy saved from avoiding boiling water	Net benefits of SDG7	TJ	1,028.00	1,006.00	Net benefits of SDG7 in this monitoring period is more than that of previous MP due to different and higher value of parameters applied as described above, especially number of person.days consuming water supplied by project scenario p through year y.
28	Number of new job created by the project with safe and healthy work environment	Net benefit of SDG8	Staff	85.00	90.00	Net benefit of SDG 8 in this monitoring period is slightly lower than that of previous MP.
29	Amount of ER	Net benefits of SDG13	tCO_2e	93,878.00	90,993.00	Total ER in this monitoring period is more than that of previous MP due to different and higher value of parameters applied as described above, especially number of person.days consuming water supplied by project scenario p through year y.
30	Area of forest save	Net benefits of SDG15	Hectare	404.00	393.00	Net benefits of SDG15 in this monitoring period is more than that of previous MP due

No	Description	Parameter	Unit	Value obtained in (CP2-MP3)	Value obtained (CP2-MP2)	Remarks on any significant different
						to different and higher value of parameters applied as described above, especially number of person.days consuming water supplied by project scenario p through year y.

D.4. Implementation of sampling plan

Objectives and reliability

The sampling objective is to meet the Gold Standard (GS) project survey requirements of the target population characteristics for the Hydrologic Ceramic Water Purifier (CWP) project in Cambodia. This will include the existing practice of treating water for consumption by boiling using high emission fuels including non-renewable biomass and fossil fuels in compliance with the GS methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 3.0 – July 2015".
This sampling plan includes determining the main characteristics as defined within the GS methodology. The methodology states for "Project Studies for a Water Treatment Scenario" that the project proponent must conduct project studies for each clean water project scenario prior to verifying emission reductions associated with the given project scenario. This approach uses ex-post project studies from which fuel consumption in the baseline scenario is back calculated.

The project proponent must conduct the following project studies for each project scenario:

- Project non-renewable biomass (NRB) assessment, if biomass is one of the fuels consumed;
- Project survey (PS) of end user characteristics;
- Baseline water boiling test (BWBT);
- Water consumption field test (WCFT) of safe water provision by project technologies and of water boiled in project scenario

For this monitoring period (CP2-MP3), project survey and Water Consumption Field Test (WCFT) were conducted, while project NRB assessment and BWBT are not required based on the methodology TPDDTEC Version 3.0.

(a) Description of implemented sampling design

he studies were conducted in compliance with the methodology provided by the Gold Standard (TPDDTEC version 3.0) and designed to be representative of all households in each target group. Households (HH) that purchased either a Tunsai or Super Tunsai ceramic water filter within the five years ending 30 June 2020 were eligible for the usage survey, project survey and WCFT. The sample size for each survey component was based on the minimum sample in the Gold Standard methodology, with additional households to compensate for any potential non-response or removal of households at the data cleaning phase.

Target population and sample frame

The project boundary is defined as the nation of Cambodia.
Households (HH) is used as the unit for baseline calculations on the basis that one CWP will cater for each HH. The target population includes all HHs in the nation of Cambodia, which are end-users of the project technology and who have purchased the CWP from 01/07/2015 through 30/06/2020 which are considered to be eligible for this crediting period.

The sample of HHs was chosen from Hydrologic's project database representing all CWP customers for whom contact information is available.
This study employs a cluster-based, sample selection methodology to ensure the final sample selected for this study is representative while optimizing fieldwork efficiency. The sample is clustered at the provincial, village, and household level.

(b) Demonstration that the samles were randomly selected and are representative of the population

Sample size

Given the various project study activities have been consolidated into a single Project Study Group (PSG) and to ensure that the accuracy requirements for each project study activity have been met, the sample size has been determined separately for each project study activity.
The various sample size calculations for each survey activity are discussed below.

Project Survey, Usage survey and water consumption field Test

The GS methodology for targeted group size with the project greater than 1000[31] states that the minimum sample size requirement that needs to be meet as part of the project study is 100 HHs and for usage survey, the sample size must include at least 30 samples for project technologies of each age being credited. For water consumption field test, the sample size is estimated by using the COV variation[32] of Table 3 in which sample size between 101 and 137 is considered as a good estimation. The overview of survey samples is shown in Figure 4.

Table 3. Variation of COV and its sample size

COV	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
90/10 precision	12	26	45	70	101	137	179	226	279

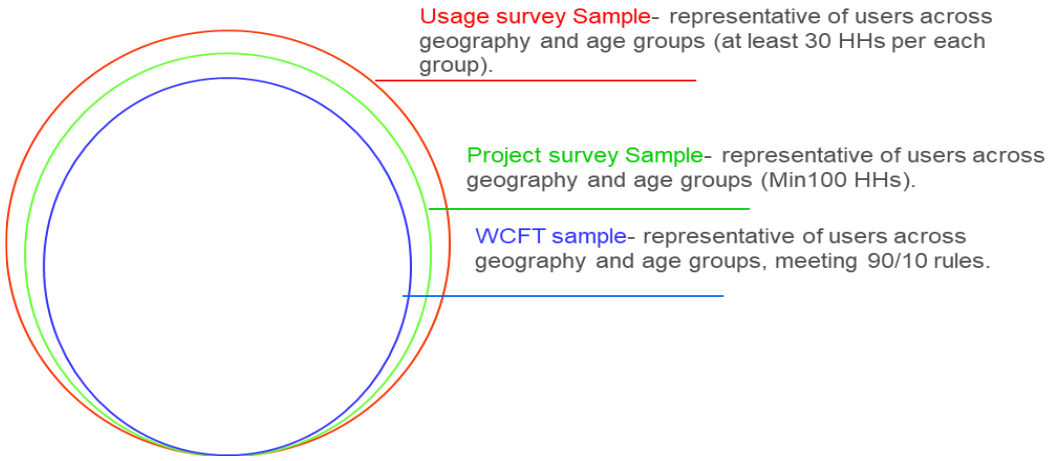


Figure 4. Overview of Survey sample

The monitoring survey (project and usage survey) was conducted in December 2020. Total of 185 households participated in the survey across the 4 representative provinces of Kampong Speu, Battambang, Kandal and Kampot. It should be noted that the 4 representative provinces were selected based on the total number of Tunsai ceramic

[31] Gold Standard (GS) Voluntary Emissions Reduction (VER) methodology, "Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 3.0- July 2015", Page 10.

[32] Gold Standard (GS) Voluntary Emissions Reduction (VER) methodology, "Technologies and Practices to Displace Decentralized Thermal Energy Consumption 3.0- July 2015", Page 44.

water filters sold in the target timeframe (July 2015 – June 2020) and geographic diversity. The World Bank and other institutions divide Cambodia into four geographic regions, with the capital city of Phnom Penh designated as its own region. Within each of these regions, the province with the most Tunsai filters sold was selected for the survey, to ensure that it would be nationally representative and cover as many Tunsai filter users as possible as described in the Provincial sampling section of the monitoring survey report[33].

Table 4. Usage and project survey and water consumption field test sample size

Survey	Target groups	Target Sample	Completed Sample	Notes
Usage survey	Ever used Tunsai	180	185	
Age 1		36	36	Filter purchase date: 1 Jul 2019-30 June 2020
Age 2		36	37	Filter purchase date: 1 Jul 2018-30 June 2019
Age 3		36	36	Filter purchase date: 1 Jul 2017-30 June 2018
Age 4		36	37	Filter purchase date: 1 Jul 2016-30 June 2017
Age 5		36	39	Filter purchase date: 1 Jul 2015-30 June 2016
Project survey	Current Tunsai users (expected)	142	161	*Based on previous usage rate
Age 1		33	36	
Age 2		29	34	
Age 3		24	30	
Age 4		29	30	
Age 5		27	31	
Water Consumption Field Test (WCFT)	Current Tunsai users	137	140	*Based on project survey respondents

For the detail on sampling design, data collection, data analysis and the result of the survey can be found in the project study report[34].

(c) Collected data

The survey instruments (questionnaire) were developed in accordance with the registered methodology by both Angkor Research company (3rd party consultant for

[33] ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean, page 6
[34] ARC_HSE_CP2-MP3_2021_Final_Report_V8_Clean

conducting the project study) and Nexus for Development (carbon expert consultant). The instruments are developed in both English and Khmer version. To ensure the instruments work effectively, before formatting the instrument into tablet-based data collection system, a field pre-testing was conducted.

Then, Computer Assisted Personal Interview (CAPI) was used to record the data for the quantitative survey. The CAPI systems were designed using the World Bank Survey Solutions software package and included section names, question labels, instructions and answers in both English and Khmer. The Khmer interface was used for data collection. The CAPI systems were tested multiple times to check the quality of the translation, the smooth flow of questions, and to make sure that all logic patterns and validation rules were working properly.

All interview cases had a unique survey ID to facilitate tracking and included Interviewer and Supervisor IDs, interview date/time, receipt of informed consent, detailed instructions, non-suggestive probing, logic patterns, validation rules, consistent variable names and coded and open-ended answer options when relevant and applicable. Draft and final versions of the instruments were formatted into tablet-based data collection systems and were ready for use during field staff training, the pilot test, and for actual data collection. The details can be found in the methodology section of the project study report.

(d) Analysis of the collected data

After the data was provided from field teams, it was cleaned by the project manager and data QC officer. Cleaning checked for any missing values, inappropriate logical skips, or likely erroneous values (outliers). Where any issues were identified, they were addressed by going back to the interviewer's or supervisor's notes for that village/household. For clarification on specific values, respondents were called to confirm correct values. The clean data was then analysed using SPSS statistical analysis software. For usage survey's respondents, results were disaggregated by the age of the filter.

(f) Demonstration that the required confidence/precision level has been met

As mentioned above the sample size and sample selection of all the survey components (usage and project survey) and field test (WCFT) were followed the registered methodology. The result from WCFT was also checked against 90/10 rule and its corresponding values are used as detailed in section C.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

Goal 1 Contribution

The project technology help users to save time spending on fuel collection/purchase and boiling water, and save household expenditure on fuel purchase and expenditure on medicine by reducing the rate of having waterborne disease. The indicator for this SDG1 would be ***the amount fuel saves; the percentage of household noted on money save after using the project technology and the percentage of time save after using the project technology*** which is relevant to the UN's SDG indicator "1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural)."

Estimating baseline outcome:

In the baseline situation, no percentage of household noted on money save and no percentage of household noted on time save after using the project technology. Therefore, the two baseline outcome benefits are zero. The amount of fuel use to boil water in the baseline scenario can be estimated as following equation:

Baseline outcome (a) of SDG1

The amount of Biomass use = $T_{p,y} * U_{p,y} * WQ_{Passed,y} * B_{use,Biomass,b,y}$ Equation 1

Baseline outcome (b) of SDG1

The amount of LPG use = $T_{p,y} * U_{p,y} * WQ_{Passed,y} * B_{use,LPG,b,y}$ Equation 2

Baseline outcome (c) of SDG1 = % of household noted on money save in the baseline scenario 0%

Baseline outcome (d) of SDG1 = % of household noted on time save in the baseline scenario 0%

Where

Parameters	Description	Source/value
Baseline outcome (a) of SDG1	Total amount of biomass fuel use in baseline (tonne)	To be calculated **Equation 1**

Baseline outcome (b) of SDG1	Total amount of LPG fuel use in baseline (tonne)	To be calculated **Equation 2**
$T_{p,y}$	Cumulative number of sold project technologies (CWP)	See section D.2
$U_{p,y}$	Weighted average usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate	See section D.2
$WQ_{Passed,y}$	Water Quality passing rate of water quality standard (WHO standard) per year	See section D.2
$B_{use\_biomass,b,y}$	Amount of fuel use per household having CWP per year (including both wood and wood equivalent converting from charcoal) in baseline	To be calculated **Equation 3**
$B_{use\_LPG,b,y}$	Amount of LPG use per household having CWP per year in baseline	To be calculated **Equation 6**

- Calculating $B_{use\_biomass,b,y}$:

$$B_{use\_biomass,b,,y} = B_{use\_wood,b,y} + B_{use\_charcoal,b,y} * F_{wood\text{-}charcoal} \quad \textbf{Equation } 3$$

Where:

Parameters	Description	Source/value
$B_{use\_wood,b,y}$	Amount of wood use per CWP per year	To be calculated **Equation** 4
$B_{use\_charcoal,b,y}$	Amount of charcoal use per CWP per year	To be calculated **Equation** 5
$F_{wood\text{-}charcoal}$	Conversion factor from wood to charcoal	See section D.1

$$B_{use\_wood,b,y} = B_{b,y,wood} \quad \textbf{Equation } 4$$

Parameters	Description	Source/value
$B_{b,y,wood}$	Quantity of fuel (wood) consumed in baseline scenario b during year y in tonnes	Equation 9

$$B_{use,b,y,\ charcoal} = B_{b,y,charcoal} \quad \textbf{Equation } 5$$

	Description	Source/value

Parameters		
$B_{b,y,charcoal}$	Quantity of fuel (charcoal) consumed in baseline scenario b during year y in tonnes	Equation 11

$$B_{use\_LPG,b,y} = B_{b,y,LPG}$$ **Equation 6**

Parameters	Description	Source/value
$B_{b,y,LPG}$	Quantity of fuel (LPG) consumed in baseline scenario b during year y in tonnes	Equation 13

Based on the above equation and monitoring survey data, the baseline outcomes was estimated as following:

Table 5. Baseline outcomes of SDG1

Indicator	Unit	Baseline situation[35]
SDG1 (a) Biomass use	tonne	88,087
SDG1 (b) LPG use	tonne	1,465
SDG1 (c) % of HH noted on money save	%	0
SDG1 (d) of % of HH noted on time save	%	0

Goal 3 contribution

The project technology help reducing smoke and dust coming from boiling water with solid biomass. The SDG's indicator of this target is ***the number of people who notice less smoke in kitchen after having water filter*** which is relevant to the UN's SDG indicator "3.9.1 Mortality rate attributed to household and ambient air pollution".

Estimating baseline outcome:

In baseline situation, no change in smoke level from boiling water. Therefore, baseline outcome benefit is zero.

Goal 5 contribution

[35] Please refer to ER spreadsheet, tab "nexus summary, cell L9:M9"

The project is compliance with the gender sensitive requirements as demonstrated in GS4GG transition Annex.

The project technology help reducing the work load on women and girls who are responsible for boiling water and collecting/purchasing cooking fuel which is contributing to the target 5.4 " Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate" of Goal 5. The SDG's indicator of this target is ***the number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel*** which is relevant to the UN's SDG indicator "5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location".

Estimating Baseline outcome:

In baseline situation, no distribution of project technology. Therefore, baseline outcome benefit is zero.

Goal 6 contribution

The project technology provides a clean water supply to the users which is contributing to the target 6.1. The SDG's indicator of this target is ***the number of people served with satisfactory level of safe/potable water*** which is relevant to the UN's SDG indicator "6.1.1 Proportion of population using safely managed drinking water services"

Estimating baseline outcome:

In baseline situation, no distribution of project technology. Therefore, baseline outcome benefit is zero.

Goal 7 contribution

The project technology has successfully promoted access to affordable and clean energy services according to the target 7.1 "by 2030 ensure universal access to affordable, reliable, and modern energy services" of Goal 7. The SDG's indicator of this target is ***the amount of energy save from avoiding boiling water for drinking*** which is relevant to the UN's SDG indicator "7.1.2 Proportion of population with primary reliance on clean fuels and technology".

Estimating baseline outcome:

In baseline situation, no distribution of project technology (CWP). Therefore, baseline outcome benefit is zero.

Goal 8 contribution

Through the project activities, it will create jobs which contribute to the target 8.5 "by 2030 achieve full and productive employment and decent work for all women and men". ***The number of new job created by the project with safe and healthy work environment is used as indicator of this SDG8*** which is relevant to the UN's SDG indicator "8.5.1 Average hourly earnings of female and male employees, by occupation, age and persons with disabilities".

The job created are logistic manager, production manager, factory worker, admin and finance officer, sale officer and field staffs.

Estimating baseline outcome:

In baseline situation, no new job created with safe and healthy work environment. Therefore, baseline outcome benefit is zero.

Goal 13 contribution

According to the selected methodology TPDDTEC Version V3.0, the project will help to save fuel which therefore reduce the GHG emission. Amount of ER is calculated according to the selected methodology which is relevant to the UN's SDG indicator SDG13.2.1. The following section will describe a step by step in estimating ER.

Baseline Emissions Calculation $BE_{b,y}$

$BE_{b,y}$

$= B_{b,y,wood} * ((\int_{NRB,b,y} * EF_{b,wood,CO2}) + EF_{b,wood,nonCO2}) * NCV_{b,wood}$ Equation 7

$+ B_{b,y,charcoal} *$ Wood to charcoal factor $* ((\int_{NRB,b,y} * EF_{b,wood,CO2}) +$

$EF_{b,wood,nonCO2}) * NCV_{b,wood}$

$+ B_{b,LPG,\ y} * ((\int_{ff,b,y} * EF_{b,LPG,CO2}) + EF_{b,LPG,nonCO2}) * NCV_{b,LPG}$

Where:

Parameters	Description	Source/value
$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO_2e	Equation 7
$B_{b,y,wood}$	Quantity of fuel (wood) consumed in baseline scenario b during year y, in tonnes	To be calculated; Equation 9
$B_{b,y,charcoal}$	Quantity of fuel (charcoal) consumed in baseline scenario b during year y, in tonnes	To be calculated; Equation 11
$B_{b,y,LPG}$	Quantity of fuel (LPG) consumed in baseline scenario b during year y, in tonnes	To be calculated; Equation 13
$\int_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass	See section D.1
$\int_{ff,b,y}$	Fraction of non-renewable fuel for fossil fuels (LPG)	See section D.1
$NCV_{b,wood}$	Net calorific value of wood that is substituted or reduced	See section D.1
$NCV_{b,LPG}$	Net calorific value of LPG that is substituted or reduced	See section D.1
Wood to charcoal conversion factor	Wood to charcoal conversion factor	See section D.1
$EF_{b,wood,CO2}$	CO_2 emissions factor of the fuel (wood) that it substituted or reduced	See section D.1
$EF_{b,LPG,CO2}$	CO_2 emissions factor of the fuel (LPG) that it substituted or reduced	See section D.1
$EF_{b,wood,nonCO2}$	Non-CO_2 emissions factor of the fuel (wood) that is substituted or reduced	To be calculated; Equation 8

$EF_{b,LPG,nonCO2}$	Non-CO_2 emissions factor of the fuel (LPG) that is substituted or reduced	See section D.1

- **Calculate $EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$**

$EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$ = [Wood Emission CH_4 Conversion Factor * Direct Global Warming Potential Equivalency (CH_4 to CO_2)] + [Wood Emission N_2O Conversion Factor * Direct Global Warming Potential Equivalency (N_2O to CO_2)] **Equation 8**

Where

Parameters	Description	Source/value
$EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$	Non-CO_2 emissions factor of wood that is substituted or reduced	Equation 8
	Wood Emission CH_4 Conversion Factor	See section D.1
	Direct Global Warming Potential Equivalency (CH_4 to CO_2)]	See section D.1
	Wood Emission N2O Conversion Factor	See section D.1
	Direct Global Warming Potential Equivalency (N_2O to CO_2)]	See section D.1

- **Calculate $B_{b,y,wood}$**

$$B_{b,y,wood} = (1-X_{boil}) * (1 - C_j) * N_{p,y} * (W_{b,y,\ WEIGHTED,wood)} * (Q_{p,y} + Q_{p,rawboil,y}) \quad \textbf{Equation 9}$$

Where

Parameters	Description	Source/value
$B_{b,y,wood}$	Quantity of wood consumed in baseline scenario p during the year y (tonnes)	Equation 9
X_{boil}	Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of project activities.	See section D.1
$N_{p,y}$	Number of person.days consuming water supplied by project scenario p through year y	See section D.2
C_j	Portion(%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.1

$W_{b,y,WEIGHTED,wood}$	Weighted Average of wood quantity in kg required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test	To be calculated, Equation 10
$Q_{p,y}$	Quantity of purified water consumed in the project scenario p per person per day	See section D.2
$Q_{p,rawboil,y}$	Quantity of raw or unsafe water boiled in the baseline scenario b per person per day	See section D.2

- **Calculate $W_{b,y,WEIGHTED,wood}$**

$W_{b,y,WEIGHTED,wood} = (W_{b,y,TRAD,wood} * \%$ of Traditional Stove Users with wood in the baseline) + ($W_{b,y,IMP,wood} * \%$ of Improved Stove Users with wood in the baseline) **Equation 10**

Where

Parameters	Description	Source/value
$W_{b,y,WEIGHTED,wood}$	Weighted Average of wood quantity in kg required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test	Calculated; Equation 10
$W_{b,y,TRAD,wood}$	Quantity of wood in kg required to treat 1 litre of water using Traditional cookstove in baseline scenario b during project year y	See section D.1
$W_{b,y,IMP,wood}$	Quantity of wood in kg required to treat 1 litre of water using Improve cookstove in baseline scenario b during project year y	See section D.1
	% of Traditional Stove Users with wood in the baseline	See section D.1
	% of Improved Stove Users with wood in the baseline	See section D.1

- **Calculate $B_{b,y,charcoal}$**

$B_{b,y,charcoal} = (1-X_{boil}) * (1 - C_j) * N_{p,y} * (W_{b,y,WEIGHTED,charcoal}) * (Q_{p,y} + Q_{p,rawboil,y})$ **Equation 11**

Where

Parameters	Description	Source/value
$B_{b,y,charcoal}$	Quantity of charcoal consumed in baseline scenario b during the year y (tonnes)	Equation 11

X_{boil}	Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of project activities.	See section D.1
C_j	Portion(%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.1
$N_{p,y}$	Number of person.days consuming water supplied by baseline scenario b through year y	See section D.2
$W_{b,y,WEIGHTED,charcoal}$	Average weighted quantity of charcoal in kg required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test	To be calculated **Equation 12**
$Q_{p,y}$	Quantity of purified water consumed in the project scenario p per person per day	See section D.2
$Q_{p,rawboil,y}$	Quantity of raw or unsafe water boiled in the baseline scenario b per person per day	See section D.2

- **Calculate $W_{b,y,WEIGHTED,charcoal}$**

$W_{b,y,WEIGHTED,charcoal} = (W_{b,y,TRAD,charcoal} * \%$ of Traditional Stove Users with charcoal in the baseline) + ($W_{b,y,IMP,charcoal} * \%$ of Improved Stove Users with charcoal in the baseline) **Equation 12**

Where

Parameters	Description	Source/value
$W_{b,y,WEIGHTED,charcoal}$	Weighted Average of charcoal quantity in kg required to treat 1 litre of water using technologies representative of baseline scenario b during project year y	**Equation 12**
$W_{b,y,TRAD,charcoal}$	Quantity of charcoal in kg required to treat 1 litre of water using Traditional cookstove in baseline scenario b during project year y	See section D.1
$W_{b,y,IMP,charcoal}$	Quantity of charcoal in kg required to treat 1 litre of water using Improve cookstove in baseline scenario b during project year y	See section D.1
	% of Traditional Stove Users with charcoal in the baseline	See section D.1
	% of Improved Stove Users with charcoal in the baseline	See section D.1

- **Calculate $B_{b,y,LPG}$**

$$B_{b,y,LPG} = (1-X_{boil}) * (1 - C_j) * N_{p,y} * (W_{b,y,WEIGHTED,LPG}) * (Q_{p,y} + Q_{p,rawboil,y}) \quad \textbf{Equation 13}$$

Where

Parameters	Description	Source
$B_{b,y,LPG}$	Quantity of LPG consumed in baseline scenario b during the year y (tonnes)	**Equation 13**
X_{boil}	Percentage of premises that would have used other non-GHG emitting technologies like chlorine treatment techniques, if available, in the absence of project activities.	See section D.1
C_j	Portion (%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.1
$N_{p,y}$	Number of person.days consuming water supplied by baseline scenario b through year y	See section D.2
$W_{b,y,WEIGHTED,LPG}$	Average weighted quantity of LPG required to treat 1 litre of water using technologies representative of baseline scenario b during project year y,	To be calculated **Equation 14**
$Q_{p,y}$	Quantity of purified water consumed in the project scenario p per person per day	See section D.2
$Q_{p,rawboil,y}$	Quantity of raw or unsafe water boiled in the baseline scenario b per person per day	See section D.2

- **Calculate $W_{b,y,WEIGHTED,LPG}$**

$$W_{b,y,WEIGHTED,\,LPG} = [(W_{b,y\_LPG(Small)} * \%\text{ of Small LPG stove usage in baseline scenario}) + (W_{b,y,LPG(Large)} * \%\text{ of Large LPG stove usage in baseline scenario})] * \%\text{ of LPG stove usage in the baseline scenario} \quad \textbf{Equation 14}$$

Where

Parameters	Description	Source
$W_{b,y,WEIGHTED,LPG}$	Weighted Average of LPG quantity in tonne required to treat 1 litre of water using technologies representative of baseline scenario b during project year y	**Equation 14**
$W_{b,y,LPG(Small)}$	Quantity of LPG in tonne required to treat 1 litre of water using LPG small stove in baseline scenario b during project year y	See section D.1
$W_{b,y,LPG(Large)}$	Quantity of LPG in ton required to treat 1 litre of water using LPG large stove in baseline scenario b during project year y	See section D.1

% of Small LPG stove usage in baseline scenario	% of Small LPG stove usage in baseline scenario	See section D.1
% of Large LPG stove usage in baseline scenario	% of Large LPG stove usage in baseline scenario	See section D.1
% of LPG stove in baseline scenario	% of LPG stove usage in the baseline scenario	See section D.1

Based on the above equations, the baseline emission for CP2-MP3[36] was estimated to be **129,807 tCO_2e**.

Goal 15 Contribution

The project technology help users to reduce amount of fuel collected or purchased especially biomass save which contribute to the area of forest save. The indicator for this SDG15 would be ***the area of forest save*** which is relevant to the UN's SDG indicator "15.1.1 Forest area as a proportion of total land area".

Estimating baseline outcome

In baseline situation, no area of forest save. Thus, baseline outcome benefit is zero.

E.2. Calculation of project value or estimation of project situation of each SDG Impact

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Goal 1 Contribution

Estimating project outcome:

In the project situation, the project outcome can be estimated as follows:

Project outcome (a) of SDG1

The amount of Biomass use = $T_{p,y} * U_{p,y} * WQ_{Passed,y} * B_{use,Biomass,p,y}$ Equation 15

Project outcome (b) of SDG1 Equation 16

[36] Please refer to ER spreadsheet, tab "Nexus_summary, cell U9"

The amount of LPG use = $T_{p,y}$ * $U_{p,y}$ * $WQ_{Passed,y}$* $B_{use,LPG,p,y}$

Project outcome (c) of SDG1 = % of household noted on money save in the project scenario

Baseline outcome (d) of SDG1 = % of household noted on time save in the project scenario

Where

Parameters	Description	Source/value
Project outcome (a) of SDG1	Total amount of biomass fuel use in project scenario (tonne)	To be calculated Equation 15
Project outcome (b) of SDG1	Total amount of LPG fuel use in project scenario (tonne)	To be calculated Equation 16
$T_{p,y}$	Cumulative number of sold project technologies (CWP)	See section D.2
$U_{p,y}$	Weighted average usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate	See section D.2
$WQ_{Passed,y}$	Water Quality passing rate of water quality standard (WHO standard) per year	See section D.2
$B_{use\_biomass,p,y}$	Amount of fuel use per household having CWP per year (including both wood and wood equivalent converting from charcoal) in project scenario	To be calculated **Equation 17**
$B_{use\_LPG,p,y}$	Amount of LPG use per household having CWP per year in project scenario	To be calculated **Equation 20**
Project outcome (c) of SDG1	Percentage of household noted on money save after using the project technology (%)	Monitoring survey
Project outcome (d) of SDG1	Percentage of household noted on time save after using the project technology (%)	Monitoring survey

- Calculating $B_{use\_biomass,p,y}$:

  $B_{use\_biomass,p,,y} = B_{use\_wood,p,\ y} + B_{use\_charcoal,p,y} * F_{wood\text{-}charcoal}$ **Equation 17**

  Where:

Parameters	Description	Source/value
$B_{use\_wood,p,y}$	Amount of wood use per CWP per year in project scenario	To be calculated **Equation** 18
$B_{use\_charcoal,p,y}$	Amount of charcoal use per CWP per year in project scenario	To be calculated **Equation** 19

$F_{wood\text{-}charcoal}$	Conversion factor from wood to charcoal	See section D.1

$$B_{use\_wood,p,y} = B_{p,y,wood}$$ **Equation 18**

Parameters	Description	Source/value
$B_{p,y,wood,y}$	Quantity of fuel (wood) consumed in project scenario p during year y in tonnes	**Equation 22**

$$B_{use,p,y,\ charcoal} = B_{p,y,charcoal}$$ **Equation** 19

Parameters	Description	Source/value
$B_{p,y,charcoal}$	Quantity of fuel (charcoal) consumed in project scenario p during year y in tonnes	**Equation 24**

$$B_{suse\_LPG,p,y} = B_{p,y,LPG}$$ **Equation 20**

Parameters	Description	Source/value
$B_{p,y,LPG}$	Quantity of fuel (LPG) consumed in project scenario p during year y in tonnes	**Equation 26**

Based on the above equation and the monitoring survey data, the project estimation for SDG1 are summarized are below:

Table 6. Project estimation for SDG1

Indicator	Unit	Project estimation[37]
SDG1 (a) Biomass use	tonne	22,547
SDG1 (b) LPG use	tonne	509
SDG1 (c) % of HH noted on money save	%	82.10
SDG1 (d) of % of HH noted on time save	%	91.20

Goal 3 contribution

[37] Please refer to ER spreadsheet, tab "Nexus_summary, cell X9:AA9"

Estimating project outcome:

In project situation, the number of people using CWP and note that their kitchen is less smoke could be calculated below:

$$SDG3\ contribution\ (number\ of\ people) = T_{p,y} * N_{p,y} * U_{p,y} * WQ_{Passed,y} * N_{Less\_smoke,y}$$

Where

Parameters	Description	Source
Project outcome of SDG3	Number of people using CWP and note that their kitchen is less smoke	To be calculated
$T_{p,y}$	Cumulative number of sold project technologies (CWP)	See section D.2
$N_{p,y}$	The average population serviced by water purification system	See section D.2
$U_{p,y}$	Usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate	See section D.2
$WQ_{Passed,y}$	Water Quality passing rate of water quality standard (WHO standard)	See section D.2
$N_{Less\_smoke,y}$	% of households notice that their kitchen is less smoke	See section D.2

Based on the above equation and the monitoring survey data, the number of people who notice less smoke in kitchen after having water filter[38] was 566,367 people.

Goal 5 contribution

Estimating Project outcome:

In the project situation, the n*umber of women and girls benefiting from stop/reducing boiling water and collecting/purchasing cooking fuel* can be estimated as following:

$$SDG5\ contribution\ (number\ of\ people) = T_{p,y} * N_{p,y} * U_{p,y} * WQ_{Passed,y} * (1-C_j) * Women\%\_HH * Women\%\_cooking$$

Parameters	Description	Source/value
Project outcome of SDG5	Number of women and girls benefiting from stop/reducing boiling water and collecting/purchasing cooking fuel	To be calculated

[38] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AB9

$T_{p,y}$	Cumulative number of sold project technologies (CWP)	Sale database
$N_{p,y}$	The average population serviced by water purification system	See section D.2
$U_{p,y}$	Usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate	See section D.2
$WQ_{Passed,y}$	Water Quality passing rate of water quality standard (WHO standard)	See section D.2
Cj	Portion(%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.1
Women%_HH	Average percentage of women and girls per household	See section D.2
Women%_cooking	Average percentage of women and girls responsible for water boiling and collecting/purchasing cooking fuel before having CWPs.	See section D.2

Based on the above equation and the monitoring survey data, number of women and girls benefiting from stop/reducing boiling water and collecting/purchasing cooking fuel [39] was estimated to be 253,713 people.

Goal 6 contribution

Estimating project outcome:
In the project situation, the number of people with access to safe drinking water can be estimated as following:

Project outcome of SDG6 = $T_{p,y}$ * $N_{p,y}$ *$U_{p,y}$ * $WQ_{Passed,y}$

Where

Parameters	Description	Source/value
Project outcome of SDG6	Number of people with access to safe drinking water	To be calculated
$T_{p,y}$	Cumulative number of sold project technologies (CWP)	See section D.2
$N_{p,y}$	The average population serviced by water purification system	See section D.2

[39] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AC9

$U_{p,y}$	Usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate	See section D.2
$WQ_{Passed,y}$	Water Quality passing rate of water quality standard (WHO standard)	See section D.2

Based on the above equation and the monitoring survey data, number of people with access to safe drinking water was estimated to be 746,201 people[40].

Goal 7 contribution

Project situation:

In project situation, the amount of energy saves from avoiding boiling water is calculated as following:

$$SDG7\ contribution = (Amount\ of\ biomass\ use\ in\ baseline\ scenario - Amount\ of\ biomass\ use\ in\ project\ scenario) * NCV_{b,wood} + (amount\ of\ LPG\ use\ in\ baseline - LPG\ use\ in\ project) * NCV_{b,LPG}$$

Where

Parameters	Description	Source
Amount of biomass use in baseline scenario	Amount of biomass use in baseline (tonne)	See Equation 1
Amount of biomass use in project scenario	Amount of biomass use in project (tonne)	See Equation 15
$NCV_{b,wood}$	Net calorific value of wood that is substituted or reduced	0.015TJ/ton (see section A.3)
Amount of LPG use in Baseline	Amount of LPG use in baseline (tonnes)	See Equation 2
Amount of LPG use in project	Amount of LPG use in project (tonnes)	See Equation 16
$NCV_{b,LPG}$	Net calorific value of LPG that is substituted or reduced	See section D.1

[40] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AD9

Based on the above equation and the monitoring survey data, the amount of energy saved from avoiding boiling water was estimated to be 1,028TJ[41].

Goal 8 contribution

Estimating project outcome:

In project situation, the number of created jobs with safe and healthy work environment is recorded by the project implementer as well as producers/retailers:

Project outcome of SDG8 = Number of created jobs with safe and healthy work environment % of worker with salaries paid are at par with wage laws in the host country.*

According to the monitoring survey data, the number of new job created by the project with safe and healthy work environment was 85 people[42],

[41] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AE8

[42] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AF9

Goal 13 contribution

Emissions for project scenario p during the year y $PE_{p,y}$ (tCO_2e)

$$PE_{p,y} = B_{p,y,wood} * ((\int_{NRB,p,y} * EF_{p,wood,CO2}) + EF_{p,wood,nonCO2}) * NCV_{p,wood} + B_{p,y,charcoal} * \text{Wood to charcoal factor} ((\int_{NRB,p,y} * EF_{p,wood,CO2}) + EF_{p,wood,nonCO2}) * NCV_{p,wood} + B_{p,y,LPG} * ((\int_{ff,p,y} * EF_{p,LPG,CO2}) + EF_{p,LPG,nonCO2}) * NCV_{p,LPG}$$

Equation 21

Where

Parameters	Description	Source
$PE_{p,y}$	Emissions for project scenario p during the year y in tCO_2e	Equation 21
$B_{p,y,wood}$	Quantity of fuel (wood) consumed in project scenario p during year y, in tonnes	To be calculated Equation 22
$B_{p,y,charcoal}$	Quantity of fuel (charcoal) consumed in project scenario p during year y, in tonnes	Equation 24
$B_{p,y,LPG}$	Quantity of fuel (LPG) consumed in project scenario p during year y, in tonnes	Equation 26
Wood to charcoal conversion factor	Wood to charcoal conversion factor	See section D.1
$\int_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass	See section D.1
$EF_{p,wood,CO2}$	CO2 emissions factor of the project fuel (wood) This is equal to the baseline fuel EF in projects which use the same fuel,	See section D.1
$EF_{p,charcoal,CO2}$	CO2 emissions factor of the project fuel (charcoal) This is equal to the baseline fuel EF in projects which use the same fuel,	See section D.1
$EF_{p,LPG,CO2}$	CO2 emissions factor of the project fuel (LPG) This is equal to the baseline fuel EF in projects which use the same fuel,	See section D.1
$EF_{p,wood,nonCO2}$	Non-CO_2 emissions factor of the project fuel (wood) This is equal to the baseline wood EF in projects which use the same fuel.	See section D.1

$EF_{p,LPG,nonCO2}$	Non-CO_2 emissions factor of the project fuel (LPG) This is equal to the baseline wood EF in projects which use the same fuel.	See section D.1
$NCV_{p,wood}$	Net calorific value of the project wood	See section D.1
$NCV_{p,LPG}$	Net calorific value of the project LPG	See section D.1

- **Calculate $B_{p,y,wood}$**

$$B_{p,y,wood} = (1 - C_j) * N_{p,y} * (W_{p,y,\,WEIGHTED,wood}) * (Q_{p,rawboil,y} + Q_{p,cleanboil,y}) \quad \textbf{Equation 22}$$

Where

Parameters	Description	Source/value
$B_{p,y,wood}$	Quantity of fuel consumed in project scenario p during the year y (tonnes)	Equation 22
$N_{p,y}$	Number of person.days consuming water supplied by project scenario p through year y	See section D.2
C_j	Portion(%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.2
$W_{p,y,WEIGHTED,wood}$	Weighted Average of wood quantity in kg required to treat 1 litre of water using technologies representative of project scenario p during project year y	To be calculated Equation 23
$Q_{p,rawboil,y}$	Quantity of raw or unsafe water boiled in the project scenario p per person per day	See section D.2
$Q_{p,cleanboil,y}$	Quantity of safe water boiled in the project scenario p per person per day	See section D.2

- **Calculate $W_{p,y,}$ WEIGHTED,wood**

$W_{p,y,WEIGHTED,wood}$ = ($W_{p,y,TRAD,wood}$ * % of Traditional Stove Users with wood in the project) + ($W_{p,y,IMP,wood}$ * % of Improved Stove Users with wood in the project) **Equation 23**

Where

Parameters	Description	Source/value
$W_{p,y,WEIGHTED,wood}$	Weighted Average of wood quantity in kg required to treat 1 litre of water using technologies representative of project scenario p during project year y, as per Baseline Water Boiling Test	Equation 23

$W_{p,y,TRAD,wood}$	Quantity of wood in kg required to treat 1 litre of water using Traditional cookstove in project scenario p during project year y	See section D.1
$W_{p,y,IMP,wood}$	Quantity of wood in kg required to treat 1 litre of water using Improve cookstove in project scenario p during project year y	See section D.1
	% of Traditional Stove Users with wood in the project scenario	See section D.2
	% of Improved Stove Users with wood in the project scenario	See section D.2

- **Calculate $B_{p,y,charcoal}$**

$B_{p,y,charcoal} = (1 - C_j) * N_{p,y} * (W_{p,y,WEIGHTED,charcoal}) * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$ **Equation 24**

Where

Parameters	Description	Source
$B_{p,y,charcoal}$	Quantity of charcoal consumed in project scenario p during the year y (tonnes)	Equation 24
C_j	Portion(%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.1
$N_{p,y}$	Number of person.days consuming water supplied by project scenario p through year y	See section D.2
$W_{p,y,WEIGHTED,charcoal}$	Average weighted quantity of charcoal in kg required to treat 1 litre of water using technologies representative of project scenario p during project year y,	To be calculated Equation 25

- **Calculate $W_{p,y,WEIGHTED,charcoal}$**

$W_{p,y,WEIGHTED,charcoal}$ = ($W_{p,y,TRAD,charcoal}$ * % of Traditional Stove Users with charcoal in the project) + ($W_{p,y,IMP,charcoal}$ * % of Improved Stove Users with charcoal in the project) **Equation 25**

Where

Parameters	Description	Source/value
$W_{b,y,WEIGHTED,charcoal}$	Weighted Average of charcoal quantity in kg required to treat 1 litre of water using technologies representative of	Calculated **Equation 25**

	project scenario b during project year y, as per Baseline Water Boiling Test	
$W_{b,y,TRAD,charcoal}$	Quantity of charcoal in kg required to treat 1 litre of water using Traditional cookstove in project scenario p during project year y	See section D.1
$W_{b,y,IMP,charcoal}$	Quantity of charcoal in kg required to treat 1 litre of water using Improve cookstove in project scenario p during project year y	See section D.1
% of Traditional Stove Users with charcoal in the project	% of Traditional Stove Users with charcoal in the project	See section D.2
% of Improved Stove Users with charcoal in the project)	% of Improved Stove Users with charcoal in the project)	See section D.2

- **Calculate $B_{p,y,LPG}$**

$$B_{p,y,LPG} = (1 - C_j) * Np_{,y} * (W_{p,y,WEIGHTED,LPG)} * (Q_{p,y} + Q_{p,rawboil,y}) \quad \textbf{Equation 26}$$

Where

Parameters	Description	Source
$B_{p,y,LPG}$	Quantity of LPG consumed in project scenario b during the year y (tonnes)	**Equation 26**
C_j	Portion(%) of users of the project technology j who in the baseline were already consuming safe water without boiling it	See section D.1
$N_{p,y}$	Number of person.days consuming water supplied by baseline scenario b through year y	See section D.2
$W_{p,y,WEIGHTED,LPG}$	Average weighted quantity of LPG in tonnes required to treat 1 litre of water using technologies representative of project scenario b during project year y,	To be calculated **Equation 27**
$Q_{p,y}$	Quantity of clean water boiled in the project scenario p per person per day	See section D.2
$Q_{p,rawboil,y}$	Quantity of raw or unsafe water boiled in the project scenario p per person per day	See section D.2

- **Calculate $W_{p,y,WEIGHTED,LPG}$**

$W_{p,y,WEIGHTED,\ LPG}$ = [($W_{p,y,LPG(Small)}$ * % of Small LPG stove usage in project scenario) + ($W_{p,y,LPG(Large)}$ * % of Large LPG stove usage in project scenario)] * % of LPG stove usage in the project scenario **Equation 27**

Where

Parameters	Description	Source/value
$W_{p,y,WEIGHTED,LPG}$	Weighted Average of LPG quantity in kg required to treat 1 litre of water using technologies representative of project scenario p during project year y	**Equation 27**
$W_{p,y,LPG(Small)}$	Quantity of LPG in tonnes required to treat 1 litre of water using small LPG cookstove in project scenario b during project year y	See section D.1
$W_{p,y,LPG(Large)}$	Quantity of LPG in tonnes required to treat 1 litre of water using Large LPG cookstove in project scenario b during project year y	See section D.1
% of Small LPG stove usage in project scenario	% of Small LPG stove usage in project scenario	See section D.2
% of Large LPG stove usage project scenario	% of Large LPG stove usage in project scenario	See section D.2
% of LPG stove usage in the project scenario	% of LPG stove usage in the project scenario	See section D.2

Based on the above equation and the monitoring survey data, the project emission for CP2-MP3 was estimated to be 33,627 tCO_2e[43].

Goal 15 Contribution

Estimating project outcome

Project outcome of SDG15 = *(Amount of biomass use in baseline scenario – Amount of biomass use in project scenario)* * f_{NRBy} /Growth stock in forest

Parameter	Description	Value/source
Amount of biomass use in baseline scenario	Amount of biomass use in baseline per year [tonne]	Equation 1

[43] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AG9

Amount of biomass use in project scenario	Amount of biomass use in project per year [tonne]	Equation 15
f_{NRBy}	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable	See section D.1
Growth stock in forest	Growth stock in forest in Cambodia	See section D.1

Based on the above equation, the area of forest saved in project scenario was estimated to be 404 hectare[44].

[44] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AH9

E.3. Calculation of leakage

It should be noted at the factory, woods are used as energy source for manufacturing ceramic pots. Thus, the wood consumption is contributing to the project leakage.

Project leakage = Leakage per Unit * Total distributed water purifier units **Equation 28**

Leakage per unit = Weight of wood per m^3 * Quantity of wood purchased for factory * Carbon content in wood* f_{NRB} * (molecular weight of CO_2/molecular weight of Carbon) / conversion from kg to tonnes / number of units sold in this monitoring period — Equation 29

Based on **Equation 28** and Equation 29, the project leakage is estimated to be 2,302 tCO_2e[45].

E.4. Calculation of net benefits or direct calculation for each SDG Impact

Goal 1 Contribution

Estimating net benefit

Net benefit (a) of SDG1 = Baseline outcome (a) of SDG1 – Project outcome (a) of SDG1

Net benefit (b) of SDG1 = Baseline outcome (b) of SDG1 – Project outcome (b) of SDG1

Net benefit (c) of SDG1 = Project outcome (c) of SDG1 – Baseline outcome (c) of SDG1

Net benefit (d) of SDG1 = Project outcome (d) of SDG1 – Baseline outcome (d) of SDG1

[45] Please refer to ER spreadsheet, tab "Units_month", Sum (M115:M126)

Table 7. Net benefits of SDG 1

Indicator	Unit	Project outcome	Baseline outcome	Net benefits[46]
SDG1 (a) Biomass use	tonne	22,547	88,087	65,540
SDG1 (b) LPG use	tonne	509	1,465	956
SDG1 (c) % of HH noted on money save	%	82.10%	0	82.10%
SDG1 (d) of % of HH noted on time save	%	91.20%	0	91.20%

Goal 3 contribution

Estimating net benefit

The net benefit of SDG3 = Project outcome of SDG3 (566,367) - Baseline outcome of SDG3 (0)

= 566,367 people.

Goal 5 contribution

Estimating the net benefit

The net benefit of SDG5 = Project outcome of SDG5 (253,713) – Baseline outcome of SDG5 (0)

=253,713 people

Goal 6 contribution

Estimating the net benefit

The net benefit of SDG6 = Project outcome of SDG6 (746,201) – Baseline outcome of SDG6 (0)

= 746,201 people.

Goal 7 contribution

[46] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AJ8:AM8

Estimating net benefit

Net benefit of SDG7= Project outcome of SDG7 (1,028) – Baseline outcome of SDG7 (0)

=1,028 TJ

Goal 8 contribution

Estimating net benefit

Net benefit of SDG8 = Project outcome of SDG8 (85) – Baseline outcome of SDG8 (0)

= 85 people

Goal 13 contribution

Net benefit of SDG13 = Baseline emission – Project emission – Leakage emission

Indicator	Baseline emission	Project emission	Leakage emission	Net benefits[47]
SDG13 Emission	129,807	33,627	2,302	93,878

Goal 15 contribution

Estimating net benefit

Net benefit of SDG15= Project outcome of SDG15 (404) – Baseline outcome of SDG15

= 404 Hectare

The following table summarizes the net benefits of the project.

[47] It should be noted that this figure is rounded.

Table 8. Summary of net benefit per each SDG

SDG	SDG Impact	Baseline estimate	Project Estimate	Net benefit[48]
SDG 13	Amount of emission (tCO_2e)	129,807	35,929[49]	93,878
SDG 1 (a)	The amount of biomass use (tonnes)	88,087	22,547	65,540
SDG 1 (b)	The amount of LPG use (tonnes)	1,465	509	956
SDG 1 (c)	% Of household noted on money save after using the project technology	0	82.10%	82.10%
SDG 1 (d)	% Of household noted on time save after using the project technology	0	91.20%	91.20%
SDG 3	Number of people who notice less smoke in kitchen after having water filter	0	566,367	566,367
SDG 5	Number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel	0	253,713	253,713
SDG 6	Number of people access to safe drinking water	0	746,201	746,201
SDG7	Amount of energy saves from avoiding boiling water in the project activity (TJ)	0	1,028	1,028
SDG 8	The number of new job created by the project with safe and healthy work environment	0	85	85
SDG15	The areas of forest save (Hectare)	0	404	404

[48] Please refer to ER spreadsheet, tab "Nexus_Summary" Cell AJ9:AT9.
[49] The project estimate includes both project emission and leakage emission.

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	SDG Impact	Values estimated in ex ante calculation of approved PDD/Transition Annex[50]	Actual values achieved during this monitoring period
SDG 13	Amount of emission reduction (tCO_2e)	85,834	93,878
SDG 1 (a)	The amount of biomass save (tonnes)	60,063	65,540
SDG 1 (b)	The amount of LPG save (tonnes)	868	956
SDG 1 (c)	% Of household noted on money save after using the project technology	88.2%	82.10%
SDG 1 (d)	% Of household noted on time save after using the project technology	89.6%	91.20%
SDG 3	Number of people who notice less smoke in kitchen after having water filter	698,148	566,367
SDG 5	Number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel	327,289	253,713
SDG 6	Number of people access to safe drinking water	763,838	746,201
SDG7	Amount of energy saves from avoiding boiling water in the project activity (TJ)	942	1,028
SDG 8	The number of new job created by the project with safe and healthy work environment	105	85
SDG15	The areas of forest save (Hectare)	370	404

[50] See HSE_CP2_ER_Cal_20191027_R1, Tab Units per month, cell AJ126:AT126

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

The calculation method of value estimated in ex ante calculation of approved PDD for this monitoring period is the same as the one in this monitoring period. However, the differences are the monitored value which will be elaborated in the following section E.6.

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

Based on the above table, some net SDGs contribution value estimated CP2-MP3 are higher than PDD/transition annex (SDG1, SDG7, SDG13, SDG15) but some are lower (SDG3, SDG5, SDG6, SDG8) because of the main following changes:

Description	PDD/ER[51]	01/01/2020 – 31/12/2020[52]	Relevant Unit	Remarks
$B_{b,y,wood}$	*0.668*	*0.491*	tonnes/year	$B_{b,y,wood}$ is lower than that presented in the PDD due to the change in volume of water consumed per HH.
$B_{b,y,charcoal}$	*0.033*	*0.021*	tonnes/year	$B_{b,y,charcoal}$ is lower than that presented in the PDD due to the change in volume of water consumed per HH.
$B_{b,y,LPG}$	*0.013*	*0.010*	tonnes/year	$B_{b,y,LPG}$ is slightly lower than that presented in the PDD due to the change in volume of water consumed per HH.
$N_{p,y}$	*1,875.735*	*1,914.180*	person.days	Latest WCFT showed that the number of person per HH is higher than that applied in PDD being 5.23 and 5.139 person per day per household respectively. This might be due to more people are back to their home town due to pandemic CoViD 19.

[51] CP2-1_HSE_CP2_PDD_20171129_Ver11.2_Final (AcceptedGS)_clean (page 40,41); and HSE_CP2_ER_Cal_20191027_R1 (Tab PDU Summary, Row 18-51), (Tab Units per month, Cell AJ126:AT126.

[52] ER spreadsheet, Tab (Parameter_Summary, column E18:E52), Tab (Parameter_Summary, column X18:X28.

$Q_{p,y}$	*1.630*	*1.190*	Litres/ person/day	Latest WCFT showed that the $Q_{p,y}$ is lower than that applied in PDD.
$Q_{p,rawboil,y}$	*1.554*	*0.550*	Litres/ person/day	Latest WCFT showed that the $Q_{p,rawboil,y}$ is lower thanthat applied in PDD.
$Q_{p,cleanboil,y}$	*0.050*	*0.030*	Litres/ person/day	Latest WCFT showed that the $Q_{p,clearnboil,y}$ is lower than that applied in PDD.
$W_{b,y,WEIGHTED,wood}$	*0.000160*	*0.000211*	tonnes/year	$W_{b,y,WEIGHTED,wood}$ is slightly higher than that applied in PDD due to the new result from BWBT conducted in CP2-MP1.
$W_{b,y,WEIGHTED,charcoal}$	*0.000008*	*0.000009*	tonnes/year	$W_{b,y,WEIGHTED,charcoal}$ is slightly higher than that applied in PDD due to the new result from BWBT conducted in CP2-MP1.
$B_{p,y,wood}$	*0.357*	*0.147*	tonnes/year	$B_{p,y,wood}$ is lower than that presented in the PDD due to the change in volume of water consumed per HH.
$B_{p,y,charcoal}$	*0.018*	*0.002*	tonnes/year	$B_{p,y,charcoal}$ is lower than that presented in the PDD due to the decrease in percentage of charcoal users in the Monitoring survey (1.2%) compared to 6% in the PDD..
$B_{p,y,LPG}$	*0.007*	*0.004*	tonnes/year	$B_{p,y,LPG}$ is lower than that presented in PDD due to differences in amount of water consumed per day.
C_j	*0.260*	*0.260*	-	No change
X_{boil}	*0.058*	*0.058*	-	No Change
$BE_{b,y,wood}$	*0.951*	*0.699*	tCO_2e	$BE_{b,y,wood}$ is lower due to lower amount of water consumption per day per person.
$PE_{p,y,wood}$	*0.508*	*0.210*	tCO_2e	$PE_{b,y,wood}$ is lower due to lower amount of water consumption per day per person.
$BE_{b,y,charcoal}$	*0.286*	*0.180*	tCO_2e	$BE_{b,y,charcoal}$ is lower than that presented in the PDD due to the decrease in percentage of charcoal users in the Monitoring survey (1.20%) compared to 6% in the PDD..

$PE_{p,y,charcoal}$	*0.153*	*0.015*	tCO_2e	$PE_{b,y,charcoal}$ is lower that presented in the PDD due to the increase in percentage of charcoal users in the monitoring survey (1.20%) compared to 6% in the PDD..
$BE_{b,y,LPG}$	*0.037*	*0.031*	tCO_2e	$BE_{b,y,wood}$ is lower due to lower amount of water consumption per day per person.
$PE_{p,y,LPG}$	*0.020*	*0.011*	tCO_2e	$PE_{p,y,wood}$ is lower amount of water consumption per day per person.
$f_{NRB,y}$	*77.00%*	*77.00%*	%	No Change
$NCV_{b,wood}$ / $NCV_{p,wood}$	*0.015*	*0.015*	TJ/ton	No change
$NCV_{b,charcoal}$ / $NCV_{p,charcoal}$	*0.030*	*0.030*	TJ/ton	No change
$NCV_{b,LPG}$ / $NCV_{p,LPG}$	*0.047*	*0.047*	TJ/ton	No change
$EF_{b,wood,CO2}$ / $EF_{p,wood,CO2}$	*112.000*	*112.000*	tCO_2/TJ	no change
$EF_{b,charcoal,CO2}$ / $EF_{p,charcoal,CO2}$	*112.000*	*112.000*	tCO_2/TJ	No change
$EF_{b,LPG,CO2}$ / $EF_{p,LPG,CO2}$	*63.100*	*63.100*	tCO_2/TJ	No change
$EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$	*8.692*	*8.692*	tCO_2/TJ	No change
$EF_{b,charcoal,nonCO2}$ / $EF_{p,charcoal,nonCO2}$	5.298	5.298	tCO_2e/TJ	No Change
$BE_{b,y}$	1.274	0.910	tCO_2e	With lower water consumption per HH, baseline emission is lower than that applied in PDD.
$PE_{p,y}$	0.681	0.236	tCO_2e	With lower water consumption per HH, project emission is lower than that applied in PDD.
$U_{p,y}$	80.5	83.18	%	Usage rate is higher than that applied in PDD and also higher than that of CP2-MP2 (82.62%). This could be due to the positive impact of the new after-sale service strategy introduced in March 2018 where all field staffs have to do after-sale service including Credit Officer (CO), Clean Water

				Expert (CWE), Provincial Manager (PM). For example, CO have to check CWP from door to door when they come to collect the instalment from users who purchased CPW via loan. Furthermore, through hygiene campaign, the knowledge of hygiene, operation and maintenance of CWPs' user is improved which may also contribute to this higher usage rate.
$LE_{p,y}$	0.010	0.012	tCO_2e	$LE_{p,y}$ is slightly higher than that applied in PDD.
% of passing Water Quality test	80.00	90.00	%	The passing rate of water quality test is higher than that projected in PDD. This might be due to the improvement of hygiene and operation and maintenance knowledge of CWP's users through PP's hygiene campaign.
ER_y	0.58	0.66	tCO_2e/Unit	ER_y is slightly higher than that presented in PDD due to the above different applied values.
Units sold	50,412	33,746	CWP	The demand for CWPs keeps on fluctuating and thus is lower than the estimated one. It should be noted that the sale estimated in PDD was forecasted in 2017 based on sale figure from 2013 to 2016 when the sale was high. The sale dropped significantly in 2018 due to Hydrologic staff restructuring and the general election in Cambodia which limited the promotion activity in the communities. During this MP (2020), the total sale from Jan to Dec was slightly lower than that of year 2019 being 33,746 and 35,061 CWPs respectively. This might be due to pandemic CoVid 19.
SDG13	84,706	93,878	tCO_2e	Total ER in this monitoring period is more than that of PDD due to different and higher value of parameters applied as described above, especially usage rate and water quality passing rate.

SDG1(a)	58,518.87	65,540	tonnes	The amount of biomass save in this MP is higher than that estimated in transition annex. This might be mainly due to the higher usage rate and water quality passing rate in this MP as mentioned above.
SDG1(b)	845.39	956	tonnes	The amount of LPG save in this MP is higher than that estimated in transition annex. This might be mainly due to the higher usage rate and water quality passing rate in this MP as mentioned above.
SDG1(c)	88.20	82.1	%	This varies depend on the perception of the user response but around 82.1% of household noted on money save after using the project technology in this MP is a good indicator.
SDG1(d)	89.60	91.2	%	This varies depend on the perception of the user response but around 91.2% of household noted on time save after using the project technology in this MP is a good indicator.
SDG3	680,203	566,367	People	Lower number of people who notice less smoke in kitchen after using CWPs in this MP compared to PDD. This varies depend on the perception of the user response.
SDG5	318,877	253,713	Women and girls	Lower number of women and girls benefiting from stop/reduce boiling water and collecting/purchasing cooking fuel after using CWPs in this MP compared to PDD. This varies depend on the perception of the user response.
SDG6	744,204	746,201	People	Higher number of people access to safe drinking water after using CWPs in this MP compared to PDD. This might be mainly due to higher people per household in this MP compared to PDD as stated above.

SDG7	917.77	1,028	TJ	The amount of energy save in this MP is higher than that estimated in transition annex. This might be mainly due to the higher usage rate and water quality passing rate in this MP which lead to higher biomass and LPG save as mentioned above.
SDG8	105	85	Staffs	The staff is fluctuating over the year. It is expected that more field staffs are recruited as PP is reopening/expanding its operation in more provinces in 2021.
SDG15	360.89	404	Hectare	The amount of area of forest save in this MP is higher than that estimated in transition annex. This is mainly due to the higher amount of biomass save in this MP compared to transition annex as mentioned above.

SECTION F. SAFEGUARDS REPORTING

The project involves in the application of silver colloid the production of water filter. Ministry of Industry and handicraft have determined the environmental impact of Hydrologic and because no chemicals are emitted no monitoring is deemed necessary. Hydrologic has followed and fulfilled the national environmental requirements as proven by its certificate for factory operation[53].

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

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As discussed in Local stakeholder consultation report, three main channels have been set up (1) Grievance Expression Process Book, (2) Telephone access, (3) Internet/Email access, as part of grievance mechanism. In this grievance mechanism, public can contact not only the project owner but also the Gold Standard as shown in below table.

[53] Certification of factory operation

E. 2. Discussion on continuous input / grievance mechanism

[See Annex W]

Discuss the Continuous input / grievance mechanism expression method and details, as discussed with local stakeholders.

	Method Chosen (include all known details e.g. location of book, phone, number, identity of mediator)	Justification
Continuous Input / Grievance Expression Process Book	Complaints or any other concerns can be stated and will be filed directly at the head office of HSE at House 97A, Street 15BT (Ta Phon), Sansom Kosal 1, Boeung Tumpun, Phnom Penh, Cambodia	Any complaint can be dropped at Hydrologic head office.
Telephone access	Hydrologic - Desk phone: 023 6911 981 - Hotline: 096 3295 599 - Hotline: 096 6767 689 Gold standard - +41 (0) 22 788 7080	Beside a desk phone, two dedicated hotlines (mobile phone) of Hydrologic are open to receive any comment, complaint from the users. The number of calls and issues is recorded and reported to project coordinator. The Gold Standard can also be contacted with this provided phone number.
Internet/email access	Hydrologic http://www.hydrologichealth.com p-coordinator@hydrologichealth.com Gold Standard www.goldstandard.org info@goldstandard.org	For users or pubic who have access to internet, they can drop their comment or complaint at both hydrologic and Gold Standard's webpage or email.

During this monitoring period, there was not any comment received from the 1st channel nor the 3rd channel but there was from the 2nd channel. The number of complaints/comments reported from the hotlines were 321 cases: issue with pot (292), issue with spigot (17), purchasing inquiry (240) and other issues (12) as shown in below table. Then, these issues were followed up with call and field visit if necessary. All the received hotline calls have been followed up and closed.

Type of issue	# of issues reported via hotline calls[54]	Status of the issues Closed cases	Pending cases
Issue with Pot (cracked, decayed, slow filtering	292	292	0
Issue with Spigot	17	17	0
Purchased inquiry	240	240	0
Other issue (filter cover, filter standing support)	12	12	0
Total	561	561	0

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

[54] HSE_CP2MP3_Hotline Tracking Record 2020 Clean, tab Summary, column L23:L27.

Description of Sustainability Matrix	Monitoring
To address the concern of high price of CWP, the calculation of the CWP is based on the break-even price of the water filter +10% markup price if there is carbon finance.	Based on the annual sale in this monitoring period, although the average price for Super Tunsai ($35.31) is slightly higher than the break-even price +10% profit margin ($34.64), the average price for regular Tunsai ($12.36) is much lower than the break-even price +10% profit margin ($29.46). Thus, the average price for the water filter is within its break-even price + 10% profit margin. The break-even price + 10% markup price is described and available to VVB[55].
To address the concern of the place where the clay is taken, Hydrologic will buy the clay only from the licensed brick manufacturing factory that authorized by the Ministry of Industry and Handicraft.	During this monitoring, PP has not purchased clay because they have enough stock from its previous purchase in 2018 from a nearby licensed brick factory. It should be noted that Hydrologic's factory is located in the brick manufacturing zone, where access to clay from the licensed factory is not difficult.
To address the concern of corruption, the field Surveys will monitor and ask how much people are paying for the water filters and assess that the prices are not unreasonable. If the prices are unreasonable, PP shall investigate the reason and take appropriate action. PP believes that this risk is low because there are so many sales people that competition will keep the price low.	The monitoring survey revealed that the mean purchase price for Tunsai and Super Tunsai is $0.00 (donation from NGOs to users) and $41.80, both of which are in line with current pricing[56].

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

[55] HSE-CP2MP3-Break Even Price_Jan-Dec 20

[56] HSE Price of Water filters_Jan-Dec 20

There is no any legal contest during this monitoring period.

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption