THE GOLD STANDARD MICRO-SCALE SCHEME PROJECT DESIGN DOCUMENT FORM - Version 2.2

CONTENTS

Annexes

SECTION A. General description of micro-scale project activity

A.1 Title of the micro-scale project activity:

Title: The Cameroon Heat Retention Cooker Project

Date of Completion: 18/01/2017

Version: 2

Version history:

Version 1 – 22/11/2016

Elaborated by: Bridge Builders UG (haftungsbeschränkt)

A.2. Project participants:

Pro Climate International

A.3 Description of the micro-scale project activity:

The goal of the project is to alleviate energy poverty, to improve the health and the lifestyle of the poor and to reduce the deforestation, and therefore protect the natural ecosystem, of Cameroon's South-West, West and Littoral regions through the subsidized dissemination of Heat Retention Cookers (HRCs) to rural and peri-urban households who rely on fuelwood as a primary source of cooking energy.

The working mechanism of heat retaining cooking is simple. The pot containing the food is brought to the boiling point. The temperature accumulated by the pot and its contents at the boiling point is enough to continue and end the cooking process in an insulated environment. The initial type of HRC technology that will be used is the "Wonder Cooker" (WC). Wonder Cookers are bags made of cotton fabric that establish the insulated environment through the use of small polystyrene beads sewn into compartments of the bag.

The owner and implementer of the project is the Cameroonian NGO Pro Climate International (PCI). PCI will produce, sell and distribute a minimum of 6,000 heat retaining cooking bags at a subsidized price to rural and peri-urban households of the project region who rely on fuelwood as their primary source of cooking energy. The goal is to distribute about 1,600 bags per year over a period of 4 years. 480 bags have already been distributed during the pilot phase of the project and are included in the carbon project. The buyer of the GS VERs to be generated by the project is the German development agency Bread for the World (BftW), who will pay a share of the purchase price upfront to facilitate the production and distribution of the wonder cookers as well as PCI's operations related to the project

activity.

History of the project

In 2011, PCI tested an improved cooking stove system ("Save80") including a heat-retention cooker, a molded polystyrene box ("Wonder Box"). Having discovered the usage of the wonder box and the enthusiasm of the test-users within the community, PCI initiated some research work on internet and found that a wide range of traditional and modern approaches for heat retention cooking was already used in different African countries. Out of these PCI found the heat retention bag, made of cotton and filled with polystyrene beads to be the most suitable one for the Cameroonian context.

In 2012, PCI contacted the German development agency Bread for the World with an initial carbon project idea centered on producing and distributing heat retaining cooking bags. In the framework of the fit4carbon initiative organized by Bread for the World, PCI's capacity and capacity building needs with regard to a carbon credit project based on the heat retaining bag technology were assessed by the pro-poor carbon project consultancy firm Bridge Builders. Following the recommendations of the fit4carbon assessment and with the support of Bread for the World and its local agent AGESFO PCI addressed all of the identified capacity gaps in the course of the year 2013. At the same time and in line with the core finding of the fit4carbon assessment PCI submitted a proposal for a heat retaining bag pilot project.

In parallel, in order to further test and underpin the suitability of the technology for the Cameroonian socio-economic environment PCI undertook many steps towards developing a carbon project with locally made heat retention cookers: A few sample heat retention cookers were imported from Rwanda and their usage was tested in some households in Buea as well as first trials to produce them locally in the period from April to August 2013. In the first quarter of 2014, from own means, PCI started a trial production and distribution to households around Buea of 20 wonder cookers.

In early 2015, the pilot project was finally approved by Bread for the World with the main objective to assess whether the implementation and registration of a heat retaining cooking bag carbon project by Pro Climate would be viable. Under this pilot project the following activities were conducted by PCI and its partners from April 2015 onwards:

- Training of seamstresses on sewing the bags
- Producing 480 pilot-bags
- Training staff on monitoring and marketing of the cooking bags
- Identifying pilot communities and women groups
- Promoting and training selected women groups on heat retaining cooking methods, selling and distributing the wonder cooker bags
- Conducting of a baseline survey by PCI's research partner University of Buea
- Designing a monitoring database
- Organizing and implementing a monitoring campaign to assess the impact after the new technology had been introduced, including carbon saving potential of the heat retaining cooking bags and their lifetime/long-term usage
- Preparing and submitting the actual business plan for scale-up, including (Gold Standard) carbon project design by PCI's carbon consultant Bridge Builders

A tabular overview of the history and the milestones of the project is presented in Table 1.

Table 1: History and milestones of the project activity

Date	Milestone	Description
11/06/2012	Heat Retention Cooker (HRC) Gold Standard project idea pitch to Bread for the World/Klima-Kollekte	Proclimate International (PCI) approaches Bread for the World (BftW, https://www.brot-fuer-die-welt.de/en/bread-for-the-world/) and its carbon offset retailer Klima-Kollekte (KK, https://klima-kollekte.de/en/info/english/) with the project idea for a Heat Retention Cooker Gold Standard carbon project.
28/06/2012	Expression of interest of BftW to PCI to pre-finance the HRC carbon project	BftW expresses its interest in the proposed HRC carbon project and invites PCI to join the carbon project idea and capacity assessment project "fit4carbon".
29/11/2012	Positive outcome of the fit4carbon assessment for the proposed HRC carbon project	The carbon consultant Bridge Builders recommends the proposed HRC carbon project for financial support with conditions: 1. Strengthening the institutional capacity of PCI with the support of BftW 2. Further research and testing of the technology 3. If conditions 1 and 2 are fulfilled, start the carbon project with a pilot phase before scaling-up the production
12/2012 – 01/2014	Various activities to comply with the pre-conditions established by BftW	BftW followed the recommendations of Bridge Builders and invited PCI to close the capacity and knowledge gaps and subsequently submit a proposal for the pilot phase of the carbon project. The fulfillment of the conditions and the elaboration of the proposal took PCI around 1 year.
02/04/2014	PCI submits the technical and financial proposal for the HRC carbon project pilot phase to BftW	PCI finally submits a funding proposal for the pilot phase of the HRC carbon project to BftW.
18/12/2014	Approval of the funding for the pilot phase by BftW	After several revisions and internal delays BftW finally approves the funding for the pilot phase of the HRC carbon project.

10/04/2015	Hiring of carbon consultant Bridge Builders	PCI hires the carbon consultant Bridge Builders to assist with the pilot phase of the carbon project. The deliverables include the processing of the emission reduction data generated during the pilot phase and the elaboration of a carbon project design to guide the choice of carbon certification scheme (GS CDM vs. GS VER) and methodology.
07-11/2015	Distribution of approx. 480 HRC bags	PCI distributes approx. 480 HRC bags under the pilot phase.
22/06/2016	Carbon project design finalized	Bridge Builders, the carbon consultant of the project, finalizes the carbon project design based on the monitored emission reductions of the 480 bags of the pilot phase. Based on this document PCI and BftW are in a position to decide whether the project should be registered as GS CDM or GS VER. (Retroactive) emission reductions for the 480 HRC bags of the pilot phase are an integral part of the calculations of the GS VER scenario.
13/10/2016	Initiation of GS VER registration	Based on the findings of the carbon project design by Bridge Builders, BftW and PCI agree to move ahead with the registration of the project (pilot phase and scale-up) as a GS VER project (vs. the alternative option to pursue GS CDM registration). PCI then contracts Bridge Builders to write the PDD and manage the validation/registration process.
17/10/2016	Feasibility study/business plan for the scale-up phase submitted to BftW	PCI submits the feasibility study/business plan for scaling up the carbon project from the pilot phase and finally registering it as a GS VER project to BftW.

A.3.1. Location of the micro-scale project activity:

A.3.1.1. Host Country:

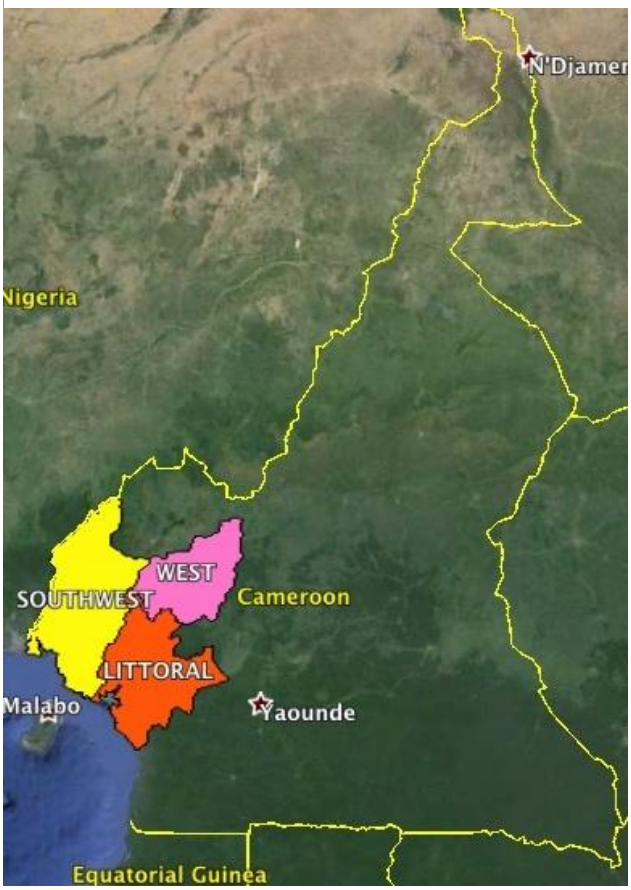
The Republic of Cameroon

A.3.1.2. Region/State/Province etc.:

The project activity is located in the South-West, West and Littoral regions of Cameroon as shown in Figure 1 below. These administrative regions correspond to the mono-modal forestry (SW, LT) and high

plateaus (W) ecological zones of Cameroon. The administrative boundaries of the three regions represent both the target area and the fuel production and collection area of the project activity.

Figure 1: Map of Cameroon with Project Area (Source: Google Earth)



A.3.1.3. City/Town/Community etc:

The project activity will be implemented in households of all rural and peri-urban communities within the project area that are eligible according to the project's design, i.e. that use fuelwood as their primary source of cooking energy in the baseline.

A.3.1.4. Details of physical location, including information allowing the unique identification of this micro-scale project activity:

The coordinates of Pro Climate International's main office, located in Buea Town/,Opposite the Market are used to represent the physical location of the project activity:

Latitude: 4°9'49.18"N

Longitude: 9°14'18.60"E

A.3.2. Description including technology and/or measure of the micro-scale project activity:

Technology

The working mechanism of heat retaining cooking is simple. The pot containing the food should be brought to the boiling point. The temperature accumulated by the pot at the boiling point is enough to continue and end the cooking process in an insulated environment. There are many different ways of achieving this effect through insulation, all of which shall be principally eligible under this project.[1]

However, the initial type of HRC technology that will be used is the "Wonder Cooker" (WC). The wonder cooker bags establish the insulated environment through the use of small polystyrene beads, which are "imprisoned" in fabrics material and sewn in different compartments in a spherical shape which can accommodate pots of various dimensions depending on the size of the bag. A lid of the same material is sewn and constitutes one of the essential parts of the bag. It helps to close the pot completely inside the bag and ensures complete thermal insulation. Not using the lid will lead to thermal losses. The bag does cook slowly and surely when operated according to instructions. That is why it is also called a slow cooker. It should be noted that the technology fits to all type of food one

Figure 2: Example of a Heat Retention Cooker ("Wonder Cooker"), body and lid

Figure 3: Wonder Cooker test with users during field trials

[1]For design examples see: http://images4.wikia.nocookie.net/__cb20080715212719/solarcooking/images/c/c3/Retained-Heat-Cookers_FINAL_7.11.2007.pdf (accessed on 01/11/2016)

can boil (not fry!). It does also keep food warm and therefore can be used as a flask. As a thermal insulator, the wonderful bag can also help keeping things cold.

Advantages

The heat retaining cooking bag presents many advantages for households and the environment as well. It is a device which helps users to save time for cooking in the sense that the food can be cooking inside the bag when he or she is asleep or is carrying out other household activities, such as working in the field or going to the market. It also saves time for gathering fuelwood, especially in rural areas. The fuelwood collected by the household can be used for a longer period because using the bag reduces fuelwood (and other fuels) consumption. In peri-urban areas, poor families rely strongly on fuelwood for cooking which is not free of charge as in rural areas. They spend about 25% of their income to purchase fuelwood. Using a heat retaining cooking bag helps them cut their expenses on fuel wood and charcoal.[2]

For fuel wood users in general, the heat retaining cooking bag prevents them from inhaling large quantities of smoke, which have a negative impact on their health in various ways: respiratory disorder, eye infections, abortion, etc., especially when unimproved fuel wood cooking equipment such as the traditional three stones are used. Heat retaining bag users experience an improvement of their life quality by reducing the stress of attending to the cooking pot so often when cooking completely on a constant fire source.

The usage of the heat retaining cooking bag implies less wood fuels burned for cooking thus less smoke emitted in the atmosphere and fewer trees cut for fuel wood. It helps reducing deforestation and carbon emissions into the atmosphere contributing therefore to fight against global warming.

A.3.3 Estimated amount of emission reductions over the chosen crediting period:

Year	Estimation of annual emission reductions in tons of CO2e
2015	671
2016	1,074
2017	2,710
2018	5,114
2019	8,347
2020	9,098
2021	6,443
2022	2,864
2023	0

[2]PCI Qualitative Survey Report 2016, p.30, 36

2024	0
Total emission reductions (tons of CO2e)	36,321
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period (tCO2e)	3,632

A.3.4. Public funding of the micro-scale project activity:

The project activity has not received any public funding with the condition that any of the GS VERs to be generated should be transferred to the country of origin of that public funding. The funds received by PCI from Bread of the World for the initiation and preparation of the project activity, i.e. for improving PCI's capacity to set up and manage a carbon project and for developing and testing the heat retention cooking technology, were strictly unconditional to the delivery of GS VERs.

Moreover, the funds that PCI will receive through the carbon loan from Bread for the World against the future delivery of the GS VERs generated by the project activity is exclusively from private sources and does not involve Official Development Aid (ODA).

SECTION B. Application of an existing baseline and monitoring methodology or of a new methodology submitted as part of this project activity

B.1. Title and reference of the existing or new baseline and monitoring methodology applied to the micro-scale project activity:

Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 2.0 (in the following: TPDDTEC methodology)

B.2 Justification of the choice of the methodology and applicability:

The methodology is applicable to *"programmes or activities introducing technologies and/or practices that reduce or displace greenhouse gas (GHG) emissions from the thermal energy consumption of households and non-domestic premises."*

→Heat retention cookers reduce the consumption of non-renewable biomass (fuelwood) and fossil fuels and therefore the related GHG emissions of the participating households.[3]

The following conditions apply:

Table 2: Applicability criteria and justification

Applicability criteria	Justification

[3]PCI Qualitative Survey Report 2016, p.13 pp

1. The project boundary needs to be clearly identified, and the technologies counted in the project are not included in any other voluntary market or CDM project activity (i.e. no double counting takes place). In some cases there maybe another similar activity within the same target area. Project proponents must therefore have a survey mechanism in place together with appropriate mitigation measures so as to prevent any possibility of double counting.	The project boundary is given through the administrative boundaries of the South-West, West and Littoral regions of Cameroon and therefore clearly identified. The project activity is the first of its kind in Cameroon. No other projects, let alone voluntary or CDM carbon projects, exist in Cameroon that deploy a similar technology. Nevertheless, for further avoidance of double counting participating households will be asked to state their involvement in any other carbon projects through the user contracts, which form part of the project's monitoring. Cases of potential double counting will be analyzed and reported in monitoring and (where applicable) excluded from the calculation of emission reductions.
2. The technologies each have continuous useful energy outputs of less than 150kW per unit (defined as the total useful energy delivered from start to end of operation of a unit divided by time of operation). For technologies or practices that do not deliver thermal energy in the project scenario but only displace thermal energy supplied in the baseline scenario, the 150kW threshold applies to the displaced baseline technology.	The typical thermal energy supplied by the baseline cooking device of the project activity – a three-stone fire – is 0.60 MJ/minute or 10kW.[4] Since the fuelwood savings that can be achieved with the heat retention cooker are in the range of 60% the displaced thermal energy of the baseline technology amounts to around 6kW, which is well below the threshold of 150kW.
3. Using the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology (e.g. discounted price for the improved technology) and the definitive discontinuity of its use. The project documentation must provide a clear description of the approach chosen and the monitoring plan	The goal of the project activity is not to replace the baseline technology but to reduce its use. However, in the course of monitoring the type and the extent of use of the baseline technology will be checked before and after the introduction of the heat retention cooker.

[4]Robinson et. al. (2010): The uncontrolled Cooking Test: Measuring Three-stone Fire Performance in northern Mozambique

must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of the improved technology. For example, whether the existing baseline technology is not surrendered at the time of the introduction of the improved technology, or whether a new baseline technology is acquired and put to use by targeted end users during the project crediting period – see section III. The success of the mechanism put into place must therefore be monitored, and the approach must be adjusted if proven unsuccessful5. If an old technology remains in use in parallel with the improved technology, the corresponding emissions must be accounted for as part of the project emissions – see section II.5.	
4. The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. For technology producers and the retailers of the improved technology or the renewable fuel in use, this must be communicated by contract or clear written assertions in the transaction paperwork. If the claimants are not the project technology end users, the end users will need to be informed and notified that they cannot claim for emission reductions from the project.	The project proponent PCI will have the ownership of emission reductions resulting from the project activity. PCI is also the producer of the technology. End users will confirm through the signature of an end user agreement that they cede the right to claim emission reductions and generate GS VERs from the use of the heat retention cooker to PCI.

5. Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules7. If the biomass feedstock is sourced from a dedicated plantation, the criteria must apply to both plantations established for the project activity AND existing plantations that were established in the context of other activities but will supply biomass feedstock.	does not apply
5.a. Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases (as listed in section II.1) emitted by the project fuel/stove combination are estimated with adequate precision. The project fuel/stove combination may include instances in which the project stove is a baseline stove.	The project stove is the baseline stove. The heat retention cooker simply reduces the use of the baseline stove and therefore the fuel consumption, indoor air pollution and the emission of GHGs, as shown by the baseline survey (BS), project survey (PS) and project performance field test (PFT) conducted by PCI.
5.b. Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section II of this methodology. These records need to be correlated to data on distribution and results of field tests and surveys confirming (a) actual use of the renewable fuel and usage patterns (such as average fraction of non-renewable fuels used in mixed combustion or seasonal variation of fuel types), (b) GHG emissions, (c) evidence of CO levels not deteriorating (d) any further factors effecting emission reductions significantly.	does not apply

B.3. Description of the project boundary:

a. The project boundary is constituted by the physical, geographical area of the use of non-renewable biomass. I.e., the project boundary is defined through the spatial extension of the compounds of the

participating households.

b. The target area is comprised of the South-West, West and Littoral regions of Cameroon. It is delineated through their administrative boundaries.

c. The fuel production and collection area is similar to the target area.

B.4. Description of the baseline and its development as per the chosen methodology:

According to the TPDDTEC methodology,*"A baseline scenario is defined by the typical baseline fuel consumption patterns in a population that is targeted for adopting the new project technology. Hence, this "target population" is a representative baseline for the project activity."*

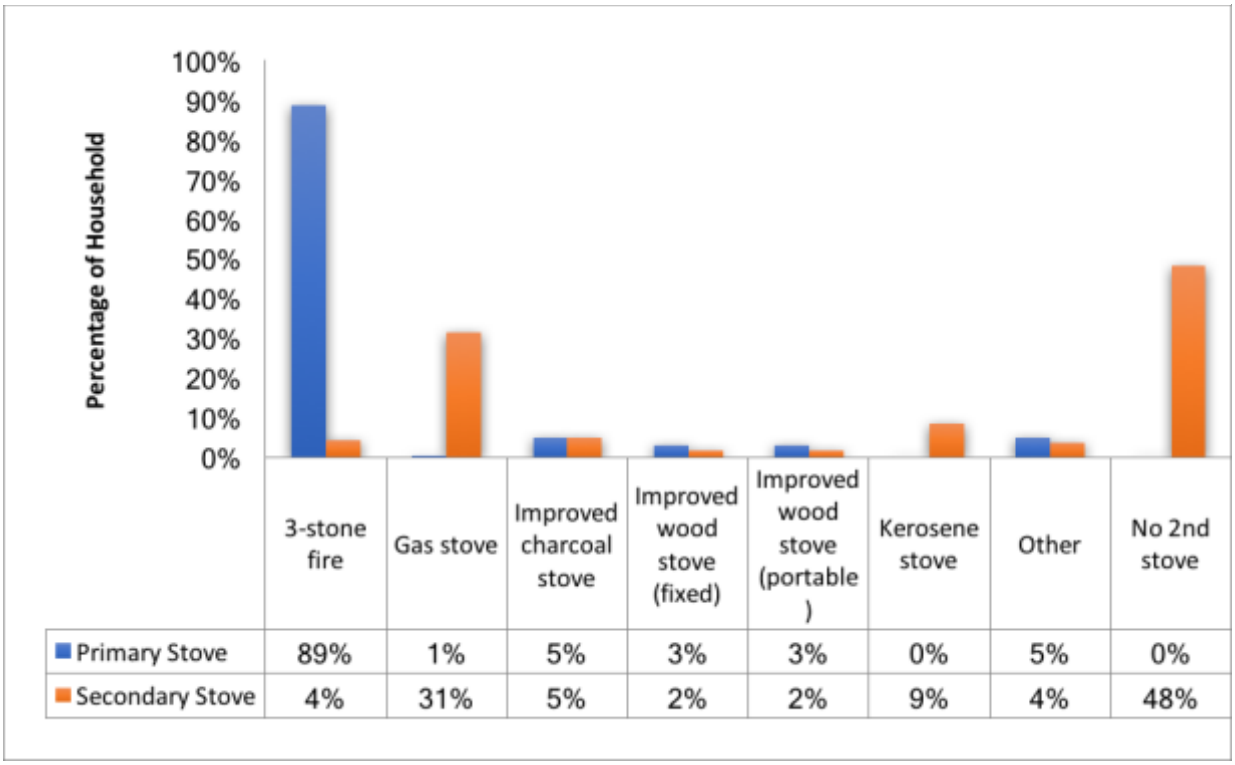
The target population of the project activity are rural and peri-urban households in Cameroon's South-West, West and Littoral regions who use fuelwood as the main source of energy for cooking. Therefore, the applicable baseline scenario is defined by the typical fuel consumption pattern of rural and peri-urban households in the aforementioned regions who use fuelwood as the main source of energy for cooking.

In order to determine the fuel consumption patterns of the target population, PCI performed a Baseline Survey (BS) in the period from July to October 2015 in the project area.[5] The BS was conducted alongside a survey of the University of Buea who performed Kitchen Performance Tests (KPTs) for a statistically representative sample of rural and peri-urban households in the project area to determine their fuelwood consumption (the "Fuelwood Baseline Survey").[6]

Almost all households (95%) used fuelwood as their primary energy source for cooking. Out of these 89% cooked on a 3-stone-fire. 6% were using improved wood cook stoves. (Figure 4)

[5]PCI (2016): Fuel Saving Potentials and Implication of Heat Retaining Cooking Bags in Rural and Peri-urban Households in the South West, West and Littoral Regions of Cameroon
[6]Nkwatoh (2016): Households Fuel wood Consumption in Rural and Sub-urban Households of the South-West, West and Littoral Regions of Cameroon

Figure 4: Use of different stove types in the target population



	3-stone fire	Gas stove	Improved charcoal stove	Improved wood stove (fixed)	Improved wood stove (portable)	Kerosene stove	Other	No 2nd stove
Primary Stove	89%	1%	5%	3%	3%	0%	5%	0%
Secondary Stove	4%	31%	5%	2%	2%	9%	4%	48%

For these households the University of Buea measured a mean fuelwood consumption of 10.8 kg/day/household or 3.942 t/year/household. This is in line with Cameroon's national fuelwood consumption statistics. According to the United Nations Statistical Division the total consumption of fuelwood by households in Cameroon was 18,006,000 m^3 in the year 2013.[7]Dividing this by the 2013 population of 21,143,237[8] and applying a default conversion factor of 0.725 t/$m^3$for air-dry wood[9]this translates to a per capita consumption of 0.62 tons of wood per year. For the average household size of 7.0 persons of the households surveyed by the University of Buea this gives a yearly fuelwood consumption of 4.34 t/year/household. Therefore, also considering that the per capita average consumption calculated based on the national statistics includes also households who do not cook with fuelwood at all, the fuelwood consumption figures provided by the University of Buea can be seen as very conservative.

[7]http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW%3btrID%3a1231 (accessed on 28/10/2016)
[8]Annuaire Statistique du Cameroun, édition 2015, Chapitre 4, http://www.stat.cm/downloads/2016/annuaire2016/CHAPITRE4_CARACTERISTIQUES_POPULATION.pdf (accessed on 28/10/2016)
[9]ftp://ftp.fao.org/docrep/fao/010/a1106e/a1106e05.pdf (accessed on 28/10/2016)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered micro-scale project activity:

The project is applying for retroactive crediting of the emission reductions generated by the approximately 480 Heat Retention Cookers that were disseminated in the course of the pilot activities. Although originally retroactive projects were not allowed to make used of the deemed additionally approach this restriction was lifted by the GS TAC on 30/04/2014. In line with this rule update the deemed additionality approaches defined in Annex T of the GS Toolkit (version 2.2) is used for the demonstration of the project's additionality. Specifically, criterion vi. of article 7. is applied:

*"The project is an emission reduction project in which **each of the independent subsystems/measures achieve annual emission reductions equal to or less than 600 tCO2** or annual energy savings equal to or less than 600 MWh or installed capacity is less than 1500 kW for households/SMEs/communities. The limits defined above apply to each subsystem or the measure implemented."*

The fulfillment of this criterion by the project is apparent if one considers that the baseline fuelwood consumption of a household that deploys an HRC is 10.80 kg/day (see section B.6.1, 4. Baseline Studies, C. Baseline Fuel Consumption below), i.e. 3.94 t/year. Applying this value in Equation (3) of the TPDDTEC methodology (also see section B.6.1, 7. Performance Field Tests and Calculation of Emission Reductions, Baseline Emission Calculations) together with the fixed parameters given in section B.6.2 we arrive at yearly baseline emissions for one household of 5.15 tCO_2. The Equation and the respective calculation of yearly baseline emissions for one HRC are:

$$BE_{b,y} = B_{b,y} * \left(\left(f_{NRB,y} * EF_{b,wood,CO2} \right) + EF_{b,wood,nonCO2} \right) * NCV_{b,wood}$$

$$BE_{b,y} = 3.94\,{}^{t}/_{y} * \left(\left(70\% * 112\,{}^{tCO_2}/_{TJ} \right) + 8.692\,{}^{tCO_2}/_{TJ} \right) * 0.015\,{}^{TJ}/_{t} = \mathbf{5.15}\,{}^{\boldsymbol{tCO_2}}/_{\boldsymbol{y}}$$

This is way below the threshold of 600 tCO_2 of yearly emission reductions. In other words, even the baseline emissions for one HRC, i.e. the independent subsystem, are below the threshold. Hence, the emission reductions of the independent subsystems are also below the threshold and the project is additional.

B.6 Emission reductions:

B.6.1. Explanation of methodological options or description of new proposed approach:

This section follows the structure of the TPDDTEC methodology *Section II: Baseline Methodology*.

1. Project Boundary

The project boundary is defined through the spatial extension of the compounds of the participating households. See section B.3 above.

Emission sources included in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Heat delivery (production of fuel, and transport of fuel occur outside the project boundary)	CO_2	Yes	The CO_2 emissions from the generation of heat for cooking through the burning of fuelwood are an important emission source.
		CH_4	Yes	The CH_4 emissions from the generation of heat for cooking through the burning of fuelwood are an important emission source.
		N_2O	Yes	The N_2O emissions from the generation of heat for cooking through the burning of fuelwood are a small emission source but will be accounted for.
Project	Heat delivery (production of fuel, and transport of fuel occur outside the project boundary)	CO_2	Yes	The CO_2 emissions from the generation of heat for cooking through the burning of fuelwood are an important emission source.
		CH_4	Yes	The CH_4 emissions from the generation of heat for cooking through the burning of fuelwood are an important emission source.
		N_2O	Yes	The N_2O emissions from the generation of heat for cooking through the burning of fuelwood are a small emission source but will be accounted for.

2. Selection of baseline scenarios and project scenarios

Baseline Scenario

The baseline of the project activity is given by the typical fuel consumption pattern of rural and peri-urban households in the project area who use fuelwood as the main source of energy for cooking. Households who use other fuels as their main source of energy for cooking are excluded from the project. See section B.4 above.

Project Scenario

The project scenario is defined by the (reduced) consumption of fuelwood by the participating households who adopted a Heat Retention Cooker in their cooking regime. Each different model of HRCs deployed under the project will be considered as a separate project scenario and will be monitored and credited separately.

Project Preparation and Monitoring Schedule

Table 3: Project preparation and monitoring schedule

	Prior to validation	Prior to first verification	Annual	Every two years
ER estimation for PDD	✔			
Baseline studies				
NRB assessment	CDM default value[14]			
Baseline survey	✔			
Baseline Field Tests (except where default values applied)	Default value[15]			
Project studies				
Preliminary estimation – ER, NRB, etc.	✔			
Project survey	✔			
Project FT	✔			
Ongoing monitoring tasks				
Maintenance of total sales record and project database	Continuous			
Usage survey			✔	
Monitoring survey			✔	
Field Tests updates				✔
Leakage assessment				✔
Updating NRB assessments	The NRB value may be updated periodically, either in line with the respective updates of the CDM default value or through a dedicated NRB assessment as per the TPDDTEC methodology.			

3. Additionality

See section B.5 above.

[14] https://cdm.unfccc.int/DNA/fNRB/index.html (accessed on 08/11/2016). The default value has been accepted by the DNA of Cameroon on September 22, 2014 and will expire on September 21, 2019.

[15] The average fuelwood consumption of rural and peri-urban households who use fuelwood as their primary source of cooking energy as determined by the University of Buea (Nkwatoh, 2016) is used. The approach of "Case of Single Sample Test" is chosen for determining the emission reductions achieved by the project activity.

4. Baseline Studies

A. Baseline Non-Renewable Biomass Assessment

Option b) of Annex 1 is chosen: Adoption of the approach similar to the latest version of CDM-approved methodology AMS II.G (i.e. version 8)

In line with the provisions of AMS II.G and the guidance of the CDM Executive Board (EB90) a default country-specific fNRB value of 70%, as approved by the Cameroonian DNA on September 22, 2014 shall be applied.

B. Baseline Survey

A Baseline Survey (BS) was conducted in the period from July to October 2015 in the project area alongside a survey of the University of Buea (UoB) who performed Kitchen Performance Tests (KPTs) for a statistically representative sample of rural and peri-urban households in the project area to determine their fuelwood consumption (see following section *C. Baseline Fuel Consumption*). Therefore, the sample of households was identical with the representative sample selected by the UoB for the KPTs. The basic approach of drawing a sample that would be representative for rural and peri-urban households in the project area who use fuelwood as a primary source of energy for cooking was:

1. **Representative subdivisions:** Based on the 2005 census data 8 rural and 8 suburban areas (on a subdivision level) were selected according to the representativeness for the study area in terms of fuelwood consumption.
2. **Demonstration of heat retaining bags to women groups:** In each of the selected areas meetings with women groups were organized according to their socio-economic representativeness for the subdivision (based on the local knowledge and common judgement of the survey team). During the meetings the heat-retaining bag technology was demonstrated to women.
3. **First-come-first-serve heat-retaining bag test households:** The first 30 women from each area that ordered the bag formed the frame of 480 women/households for the drawing of the survey sample at the second stage. It was clarified that only households that use fuelwood (or charcoal) as a primary source of energy for cooking could be accepted.
4. **Random selection of survey sample of 160 households:** The 30 households were ordered randomly (blind drawing of names) and then approached in the given order regarding their availability to participate in the survey. The first 10 women/households that were available became the participants of the survey.

As oversampling was applied to adjust for potential outliers the total size of the sample was 185 households. On behalf of PCI the enumerators of the UoB administered the BS questionnaire alongside the fuelwood measurements of the KPT in all of these 185 households. Subsequently, the filled in questionnaires were handed over to PCI who processed the information electronically and analyzed the data. The information gathered through the BS included:

1. User follow up
    a. Address or location
    b. Mobile telephone number
2. End user characteristics
    a. Number of people served by baseline technology

   b. Typical baseline technology usage patterns and tasks
3. Baseline technology and fuels
   a. Types of baseline technologies used and estimated frequency
   b. Types of fuels used and estimated quantities
   c. Seasonal variations in baseline technology and fuel use
   d. Sources of fuels; (purchased or hand-collected, etc.) and prices paid or effort made

The full questionnaire and the results of the survey are available for validation.

C. Baseline Fuel Consumption

The baseline fuel of the baseline scenario is fuelwood. For determining the baseline fuelwood consumption Option 1 is chosen – a default value. Therefore, we follow the provisions for "Case of Single Sample Test"with regard to establishing the default value and calculation of emission reductions.

According to footnote 24 on page 18 of the TPDDTEC methodology "*…in cases where the monitoring plan ensures … that kitchen performance tests (KPT) in the project situation are conducted so as to allow for fuel consumed by retained baseline stoves, a default quantity of fuel may be used. … …, the value of baseline fuel consumption in the considered target area …, may be found from credible literature such as a credible and validated report from a survey by a third party …*"

As the monitoring plan indeed includes Kitchen Performance Tests (KPTs) in the project situation, i.e. for the Project Performance Field Tests (see section B.7) the project activity is eligible to apply a default value for the quantity of fuelwood consumed in the baseline scenario. The source used to establish the baseline fuel(wood) consumption is the survey that was conducted by the University of Buea (UoB) in the period from July to October 2015. This period was considered as representative for the entire year as the literature review performed in the context of the study did not reveal any seasonal variations in the consumption of fuelwood by households in the study area. The UoB established a **mean daily fuelwood consumption of 10.80 kg per household** for rural and peri-urban households in the South-West, West and Littoral regions who rely on fuelwood as their primary source of energy for cooking. The selection procedure for the study involved different probability and non-probability methods and two stages to arrive at a sample that was representative for the sampling frame. The result had a relative precision of 9.9% at 90% confidence, which is remarkably accurate given the size of the target area/population.6

5. Project Studies

A. Project non-renewable biomass (NRB) assessment

At least until September 21, 2019 when the default value approved by the Cameroonian CDM Designated National Authority (DNA) expires no Project NRB assessment is required. After September 21, 2019 either the updated CDM default value shall be adopted or a dedicated NRB assessment as per the TPDDTEC methodology shall be performed. Notwithstanding, the project proponent may choose to perform a Project NRB assessment prior to the above-mentioned date and update the fNRB value accordingly (also see section B.7.1).

B. Project Survey (PS) of target population characteristics

A Project Survey (PS) and a Project Performance Field Test (PFT) were conducted by PCI in the period from March to May 2016. The participants were the same households in which the University of Buea (UoB) had performed Kitchen Performance Tests (KPTs) to determine their fuelwood consumption, where the Baseline Survey (BS) questionnaires had been administered, and where subsequently HRCs (Wonder Cooker bags) had been deployed.

Therefore, the 185 households that were approached for the PS and PFT constitute a simple random sample of the 480 households who participated in the pilot project as they were drawn randomly in step 4 of the sampling procedure described under *4. Baseline Studies / B. Baseline Survey* above. Of the 185 households that were approached 171 could be reached and participated in the Project Survey (and in the Project PFT).

The information gathered through the PS included:

1. User follow up
    a. Address or location
    b. Mobile telephone number
2. End user characteristics
    a. Number of people served by baseline and project technology
    b. Typical baseline and project technology usage patterns and tasks
3. Baseline and project technology and fuels
    a. Types of baseline and project technologies used and estimated frequency
    b. Types of fuels used and estimated quantities
    c. Seasonal variations in baseline technology and fuel use
    d. Sources of fuels; (purchased or hand-collected, etc.) and prices paid or effort made

The full questionnaire and the results of the survey are available for validation.

C. Project performance field test (PFT)

Together with the Project Survey PCI also performed a Project PFT. The PFT consisted of 3-day Kitchen Performance Tests (KPTs) in the same 171 randomly selected households. For details on the PFT procedure and its results please see section *7. Performance Field Tests and Calculation of Emission Reductions* below.

6. Leakage

Potential Source of Leakage	Discussion	Leakage risk

a) The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.	No baseline technologies are displaced. The HRC technology works in combination with the baseline technology, i.e. 3-stone fire and/or improved wood cook stoves.	Very low
b) Non-project users who previously used lower emitting energy sources use the non-renewable biomass or fossil fuels saved under the project activity.	As shown in the baseline and in the project survey the alternative cooking technologies to the 3-stone fire and improved wood cook stoves targeted by the project activity are gas, kerosene, charcoal and sawdust stoves. Of these only gas and kerosene stoves use lower emitting energy sources. Furthermore, again as found in the BS the reason for households to cook on gas or kerosene stoves is not a scarcity of fuelwood but rather a general preference for these cleaner, more convenient technologies. However, gas and kerosene are expensive and this is the reason why poorer households cook with fuelwood, charcoal or sawdust. Therefore, an additional availability of fuelwood (through the savings achieved with the HRC technology) will not lead to a switch from gas or kerosene stoves back to 3-stone fire or improved cook stoves as it does not affect the financial situation of gas and kerosene stove users at all.	Very low

c) The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario.	The projected average yearly fuelwood savings of the project activity are in the range of 7,500 tons/year. For rural areas of the South-West, West and Littoral regions only Atyi et. al. (2016) estimate the annual fuelwood consumption by households and the annual fuelwood logging for sale at 852,602 tons/year and 392,000 tons/year respectively, that is a total of 1,244,602 tons/year.[16] Other major types of consumption of wood like construction, carpentry or export are not considered in this calculation. Therefore, in a worst-worst-case scenario where the 7,500 tons/year saved by the project represent exclusively non-renewable biomass, the NRB fraction of any other CDM or VER project activity in the project area would be reduced from 70% (CDM default) to 69.8%. This would imply a change of 0.28% of the emission reductions of other CDM or VER project activities, which is certainly not a significant impact.	Very low
d) The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.	As confirmed by the baseline survey households do not use space heating at all in the tropical, equatorial climate of the three regions covered by the project activity.	Very low
e) By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.	See item b) above. If at all, the project stimulates a substitution of the high-emitting baseline technology (3-stone fire or improved wood cook stove) as the savings on fuelwood and shortened cooking times thanks to the HRCs allow them to move up on the energy ladder to low-emitting technologies like gas or kerosene stoves.	Very low

[16]Atyi et. al. (2016): Economic and social importance of fuelwood in Cameroon, www.cifor.org/publications/pdf_files/.../AEbaa-Atyi1602.pdf (accessed on 13/11/2016)

7. Performance Field Tests and Calculation of Emission Reductions

As discussed under *4. Baseline Studies / C. Baseline Fuel Consumption* above the methodological approach of **Case of a Single Sample Test** is followed for Performance Field Tests and Calculation of Emission Reductions. The chosen default value is a mean daily fuelwood consumption of 10.80 kg per household or in other words a fuelwood consumption of **3.942 tons of air-dry fuelwood per household and year** established by the University of Buea.6

Project Performance Field Test

The Project PFT was conducted in the period from March to May 2016 by PCI in the same 171 households, where the Project Survey was performed. The PFT consisted of a 3-day Kitchen Performance Tests (KPTs) in line with the guidance provided in Annex 4 of the TPDDTEC methodology. Therefore, daily variations were considered as per the design of the survey. Per the literature review performed by the University of Buea in the context of their study on household fuelwood consumption in the project area seasonal variations do not exist.

The 171 surveyed households were a subset of the 185 households that were selected randomly by the UoB during their study. As discussed under *4. Baseline Studies / B. Baseline Survey* (Steps 3 and 4) the 185 households in turn are a random subset of the 480 households who received a Wonder Cooker HRC as part of the pilot activities of the project. At the time of the Project PFT the 171 households – which were those of the 185 households who were available when they were contacted by the enumerators – therefore constituted a random sample of the population of the then 480 project households.

Representativeness

To ensure that the households who participated in the Project PFT were representative for the eligible project households, i.e. households who use fuelwood as their primary source of cooking energy, the sample was reduced to 160, excluding 11 households who were charcoal users. This step was needed because at the design stage PCI had still considered charcoal users as eligible to participate in the project. However, after the BS and PS it was found that the share of households who use charcoal for cooking in the project area is rather small, and charcoal users were excluded from the project.

Prior to performing the KPTs the enumerators made it explicit to households that they must behave and consume fuel normally, to use those cooking devices (including all kinds of primary and secondary stoves as well as the Wonder Cookers) that they normally use and to cook typical meals during the 72 hours of the tests. On the other hand, the enumerators explained to households that unusual cooking events, such as parties or other extracurricular events of the household, should be avoided.

As an additional measure to ensure representativeness and quality of the data, PCI screened the results of the KPT for extreme outliers during the statistical analysis. For this analysis(as suggested by the study of the University of Buea) the fuelwood savings per adult equivalent were used as the target variable. In other words, those households where the changes between the baseline value and the Project PFT value in terms of fuelwood used to cook for one “normalized” adult were very extreme, compared to the rest of the population. For the determination of “extreme” Tukey’s outlier labelling rule was used that defines upper and lower thresholds based on the 25 and 75 percentiles of a data set. In this way, a total of 4 extreme outliers was eliminated, resulting in a final sample of 156 households.

A list of the 156 values with the respective unique identifier of the household is provided in Table 4 below.

Sample Sizing and Statistical Estimate of the Fuel or Emission Savings

According to the provisions of "Case of a Single Sample Test" the Project PFT was analysed as a single data set, independently from the baseline default value. The **mean daily fuelwood consumption per household** that used a Wonder Cooker in combination with its baseline fuelwood cooking device is **3.4687 kg/HH/day**.

To prove the validity of the mean daily fuelwood consumption value obtained through sampling its relative precision needs to be calculated. For this calculation we follow the statistical method given in Appendix 4, par. 4 (p. 94pp) of the CDM Guideline "Sampling and surveys for CDM project activities and programmes of activities" (Version 04.0):

1. Calculate the standard error of the mean value that is being estimated (i.e. daily fuelwood consumption of households)

$$SE = \sqrt{(1-f)\frac{s^2}{n}}$$

Where:

SE	Standard error of the mean
s^2	Sample variance (s is the sample standard deviation)
$f = \frac{n}{N}$	Sampling fraction – the proportion of the population that is sampled
N	Total population that is sampled
n	Sample size

2. Calculate the absolute precision of the sample

Precision of estimate = t-value x SE

The t-value depends on (i) the level of confidence and (ii) the sample size. It can be acquired from statistical tables for the t-distribution. It can also be derived in Excel using the TINV function.[17]

3. The relative precision is then calculated by dividing the absolute precision by the mean value

[17] TINV(0.10,(sample size minus 1)) will give the t-value associated with 90% confidence.

Relative precision of estimate = precision / mean

Applying these formulae to the daily fuelwood consumption values that were measured for the final sample of 156 households as shown in Table 4 below yields the following results:

For calculating the sample variance we use the Excel function VAR.S. Then:

$s^2 = 4.252623424$

Inserting this value together with the known values for sample size *n* (156) and total population *N* (480) gives us the standard error:

$$SE = \sqrt{\left(1 - \frac{156}{480}\right)\frac{4.252623424}{156}} = 0.135649454$$

The t-value at 90% for a sample size of 156 is 1.654743774. Therefore, the precision of the estimate is:

1.654743774 x 0.135649454 = 0.22446509

Dividing the absolute precision by the mean value of the sample of 3.4687 kg/HH/day gives us the relative precision:

0.22446509 / 3.4687 = **6.5%**

In other words, the precision of the mean daily fuelwood consumption per household of 3.4687 kg/HH/day at 90% confidence is 6.5% and therefore **the 90/10 rule as per Option a. of the "Case of a Single Sample Test" statistical requirements is fulfilled**.

Table 4: Mean daily fuelwood consumption of the final sample of 156 households of the Project PFT

HH ID	Air-dry wood (kg/day)	HH ID	Air-dry wood (kg/day)	HH ID	Air-dry wood (kg/day)	HH ID	Air-dry wood (kg/day)
P-BUE-0002	2.98	P-LBE-0022	6.47	R-BFG-0016	1.90	R-MBA-0012	2.77
P-BUE-0005	4.40	P-LBE-0024	4.90	R-BFG-0019	2.40	R-MBA-0016	1.50
P-BUE-0006	2.86	P-LBE-0028	2.47	R-BFG-0026	2.66	R-MBA-0017	3.55
P-BUE-0007	3.67	P-LBE-0029	1.93	R-BFG-0028	2.20	R-MBA-0019	1.53
P-BUE-0008	2.34	P-MUY-0002	2.12	R-BFG-0030	2.94	R-MBA-0020	1.27
P-BUE-0009	3.16	P-MUY-0003	4.24	R-BMG-0003	3.74	R-MBA-0021	1.83
P-BUE-0015	2.06	P-MUY-0014	3.83	R-BMG-0005	3.77	R-MBA-0022	2.90
P-BUE-0016	2.60	P-MUY-0015	2.38	R-BMG-0006	7.73	R-Mbo-0001	3.29
P-BUE-0017	4.75	P-MUY-0016	4.98	R-BMG-0007	3.96	R-MBO-0003	2.64
P-BUE-0022	1.27	P-MUY-0017	3.38	R-BMG-0010	2.84	R-MBO-0004	5.20

P-DLA-0011	2.09	P-MUY-0019	3.00	R-BMG-0012	6.20	R-MBO-0005	12.65
P-DLA-0015	2.90	P-MUY-0023	1.57	R-BMG-0013	5.55	R-MBO-0007	2.28
P-DLA-0016	2.57	P-MUY-0024	2.01	R-BMG-0014	3.85	R-MBO-0009	2.83
P-DLA-0029	9.55	P-MUY-0025	1.91	R-BMG-0022	5.61	R-MBO-0012	3.36
P-DSG-0001	2.58	P-MUY-0026	3.63	R-BMG-0028	3.14	R-MBO-0019	4.83
P-DSG-0003	2.37	P-MUY-0027	3.73	R-DSG-0001	3.27	R-MBO-0024	4.67
P-DSG-0008	2.85	P-NKS-0005	1.93	R-DSG-0002	5.97	R-MBO-0026	5.21
P-DSG-0010	1.87	P-NKS-0009	1.21	R-DSG-0003	5.57	R-MUY-0001	2.61
P-DSG-0017	3.27	P-NKS-0013	1.13	R-DSG-0005	2.33	R-MUY-0004	4.07
P-DSG-0018	1.02	P-NKS-0015	1.43	R-DSG-0010	4.22	R-MUY-0009	3.71
P-DSG-0023	2.40	P-NKS-0019	1.89	R-DSG-0012	8.03	R-MUY-0010	8.63
P-DSG-0024	2.53	P-NKS-0020	1.88	R-DSG-0018	2.36	R-MUY-0014	5.14
P-DSG-0026	1.88	P-NKS-0021	1.46	R-DSG-0020	2.46	R-MUY-0015	9.83
P-DSG-0027	3.40	P-NKS-0023	1.75	R-DSG-0021	7.74	R-MUY-0020	2.22
P-KBA-0001	3.63	P-NKS-0025	0.70	R-DSG-0029	6.80	R-MUY-0021	2.17
P-KBA-0005	3.38	P-TKO-0001	1.78	R-KBA-0001	3.48	R-MUY-0023	4.51
P-KBA-0006	2.88	P-TKO-0005	1.87	R-KBA-0006	4.25	R-MUY-0024	1.85
P-KBA-0007	2.33	P-TKO-0007	1.94	R-KBA-0007	3.42	R-MUY-0025	6.11
P-KBA-0008	1.13	P-TKO-0008	9.19	R-KBA-0009	3.18	R-NKS-0002	2.57
P-KBA-0010	6.14	P-TKO-0012	3.73	R-KBA-0013	8.77	R-NKS-0007	3.97
P-KBA-0011	0.97	P-TKO-0013	12.33	R-KBA-0015	3.54	R-NKS-0009	4.15
P-KBA-0012	1.40	P-TKO-0016	2.01	R-KBA-0017	2.16	R-NKS-0011	2.28
P-KBA-0013	3.46	P-TKO-0025	4.00	R-KBA-0025	5.32	R-NKS-0016	3.66
P-KBA-0017	1.13	P-TKO-0026	2.26	R-KBA-0027	1.79	R-NKS-0021	3.61
P-KBA-0028	3.69	P-TKO-0027	4.02	R-MBA-0002	1.77	R-NKS-0022	2.40
P-LBE-0001	3.75	R-BFG-0002	4.75	R-MBA-0004	1.47	R-NKS-0023	2.16
P-LBE-0007	3.18	R-BFG-0007	2.95	R-MBA-0006	1.57	R-NKS-0024	6.13
P-LBE-0017	2.85	R-BFG-0013	3.68	R-MBA-0009	3.87	R-NKS-0025	2.44
P-LBE-0020	3.46	R-BFG-0015	1.43	R-MBA-0010	2.93	R-NKS-0029	3.17

Baseline Emission Calculations

Baseline emission calculations are conducted as follows:

$$BE_{b,y} = B_{b,y} * \left(\left(f_{NRB,y} * EF_{b,wood,CO2} \right) + EF_{b,wood,nonCO2} \right) * NCV_{b,wood} \quad \textbf{(3)}$$

Where:

$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO_2e

$B_{b,y}$	Quantity of fuelwood consumed in baseline scenario b during year y, in tons, as per by-default factor
$f_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{b,wood}$	Net calorific value of fuelwood (IPCC default of 0.015 TJ/ton)
$EF_{b,wood,CO2}$	CO_2 emission factor of fuelwood (IPCC default of 112 tCO_2/TJ)
$EF_{b,wood,nonCO2}$	Non-CO_2 emission factor of fuelwood (IPCC default of 8.692 tCO_2e/TJ)

$B_{b,y}$ shall be calculated according to the following formula:

$$B_{b,y} = N_{p,y} * P_{b,y} \textbf{(4)}$$

Where:

$N_{p,y}$	Project technology-days in the project database for project scenario p through year y
$P_{b,y}$	Quantity of fuelwood consumed by a household in baseline scenario b per day, in tons, as per by-default factor

Project Emission Calculations

Project emission calculations are conducted as follows:

$$PE_{p,y} = B_{p,y} * \left(\left(f_{NRB,y} * EF_{p,wood,CO2} \right) + EF_{p,wood,nonCO2} \right) * NCV_{p,wood} \textbf{(5)}$$

Where:

$PE_{p,y}$	Emissions for project scenario p during the year y in tCO_2e
$B_{p,y}$	Quantity of fuelwood consumed in baseline scenario b during year y, in tons, as derived from the statistical analysis conducted on the data collected during the project performance field test
$f_{NRB,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{p,wood}$	Net calorific value of fuelwood (IPCC default of 0.015 TJ/ton)
$EF_{p,wood,CO2}$	CO_2 emission factor of fuelwood (IPCC default of 112 tCO_2/TJ)
$EF_{p,wood,nonCO2}$	Non-CO_2 emission factor of fuelwood (IPCC default of 8.692 tCO_2e/TJ)

$B_{p,y}$ shall be calculated according to the following formula:

$$B_{p,y} = N_{p,y} * \left(\left(P_{p,y} * U_{p,y} \right) + \left(P_{b,y} * \left(1 - U_{p,y} \right) \right) \right) \textbf{(6)}$$

Where:

$N_{p,y}$	Project technology-days in the project database for project scenario p through year y
$P_{p,y}$	Quantity of fuelwood consumed by a household in project scenario pper day, in tons, as per project performance field test
$P_{b,y}$	Quantity of fuelwood consumed by a household in baseline scenario b per day, in tons, as per by-default factor
$U_{p,y}$	Cumulative usage rate for HRCs in project scenario p during year y, based on cumulative installation rate and drop-off rate

Cumulative Emission Reduction Calculations

The overall GHG reductions achieved by the project activity are then calculated as follows:

$$ER_y = \sum BE_{b,y} - \sum PE_{p,y} - \sum LE_{p,y} \textbf{(7)}$$

Where:

ER_y	Emission reduction for total project activity in year y (tCO_2e/yr)
$BE_{b,y}$	Emissions for baseline scenario b during the year y in tCO_2e
$PE_{p,y}$	Emissions for project scenario p during the year y in tCO_2e
$LE_{p,y}$	Leakage for project scenario p during the year y in tCO_2e

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$P_{b,y}$**
Data unit:	kg/household/day
Description:	Quantity of air-dry fuelwood consumed by households in the baseline scenario per day
Source of data used:	Nkwatoh (2016): Households Fuel wood Consumption in Rural and Sub-urban Households of the South-West, West and Littoral Regions of Cameroon

Value applied:	10.80
Justification of the choice of data or description of measurement methods and procedures actually applied:	In line with section 4.C of the TPDDTEC methodology Option 1 for determining the baseline fuelwood consumption is chosen – a default value. The default value is chosen according to the provisions of footnote 24 under "Case of Single Sample Test". See section B.6.1 above for a detailed justification.
Any comment:	n/a

Data / Parameter:	**$EF_{b,wood,CO2}$ / $EF_{p,wood,CO2}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of wood fuel
Source of data used:	TPDDTEC methodology
Value applied:	112
Justification of the choice of data or description of measurement methods and procedures actually applied:	Methodology default value for wood/wood waste
Any comment:	n/a

Data / Parameter:	**$EF_{b,wood,nonCO2}$ / $EF_{p,wood,nonCO2}$**
Data unit:	tCO_2/TJ
Description:	Non-CO_2 emission factor of wood fuel
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 2.5
Value applied:	8.692 ((CH_4=0.3*GWP 25) + (N_2O=0.004*GWP 298))

Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default values
Any comment:	n/a

Data / Parameter:	**$NCV_{b,wood}$ / $NCV_{p,wood}$**
Data unit:	TJ/ton
Description:	Net calorific value of air-dry wood
Source of data used:	IPCC default for wood fuel
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures actually applied:	As per TPDDTEC Equation 3
Any comment:	n/a

B.6.3 Ex-ante calculation of emission reductions:

To arrive at the ex-ante estimate of emission reductions of the project activity the fixed parameter values presented in section *B.6.2* and the estimated values for the monitoring parameters presented in section *B.7.1* are applied to the emission reduction formulae given in section *B.6.1 – 7. Performance Field Tests and Emission Reduction Calculations*. The three parameters that are uncertain and can only be estimated at this point are:

1. The lifetime of the HRCs (i.e. Wonder Cookers here)
2. The number of HRCs (i.e. Wonder Cookers) deployed per year
3. The drop-out rate (i.e. devices that either break before the end of the estimated lifetime, where users are not found during monitoring or that are abandoned by the user)

The following estimates are made for these three parameters:

Table 5: Estimates of monitoring parameter values and justifications

<table>
<tr><th>Parameter</th><th>Value</th><th>Justification</th></tr>
<tr><td>Lifetime of Wonder Cookers</td><td>3 years</td><td>Based on the experiences with the technology in the pilot project. 55% of Wonder Cookers of a small technology trial (20 bags) in 2014 were still in good shape after 2 years of use. During the Project Survey (PS) all of the 171 bags assessed were still in perfect condition (after approx. 9 months of use).</td></tr>
<tr><td>Wonder Cookers deployed and project technology-days $N_{p,y}$</td><td>
<table>
<tr><th></th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th></tr>
<tr><td>Wonder Cookers deployed</td><td>480</td><td>-</td><td>1,200</td><td>1,600</td></tr>
<tr><td>Cumulative number of WCs</td><td>480</td><td>480</td><td>1,680</td><td>2,800</td></tr>
<tr><td>$N_{p,y}$ (in thousands)</td><td>87.6</td><td>175.2</td><td>394.2</td><td>730</td></tr>
<tr><td></td><td>Year 5</td><td>Year 6</td><td>Year 7</td><td>Year 8</td></tr>
<tr><td></td><td>1,600</td><td>1,600</td><td></td><td></td></tr>
<tr><td></td><td>4,400</td><td>4,800</td><td>3,200</td><td>1,600</td></tr>
<tr><td></td><td>1,314</td><td>1,460</td><td>1,168</td><td>584</td></tr>
</table>
</td><td>Year 1 represents the period from July 2015 when PCI started distributing Wonder Cookers under the pilot activities until June 2016. Sales of Wonder Cookers will be resumed as soon as the project activity obtains GS registration, which is anticipated for May 2017. The figures from Year 3 onwards reflect PCIs sales targets, based on the experiences gained with the pilot activities. The project technology-days are calculated with the assumption that sales are distributed evenly over a given year and that the bags have a lifetime of 3 years.</td></tr>
</table>

Usage rate $U_{p,y}$	**Year 1** | **Year 2** | **Year 3** | **Year 4** 80% | 64% | 72% | 73% **Year 5** | **Year 6** | **Year 7** | **Year 8** 66% | 65% | 58% | 51%	The experiences with the 2014 trial and PCI's registered improved cook stove (ICS) GS microscale project suggest yearly drop-outs in the order of 20% per batch of devices due to various reasons (break because of misuse, giving-away of devices, users move, etc.). The values represent then the age-adjusted, weighted overall usage rate. They are calculated based on the 20% yearly drop-out per batch, weighted for the overall share of the batches within the total number of operational devices in each year.

The calculated parameters for the respective years as per the equations in section B.6.1 are then:

Param.	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
$B_{b,y}$	t wood	946	1,892	4,257	7,884	14,191	15,768	12,614	6,307	**63,860**
$BE_{b,y}$	tCO2e	1,236	2,472	5,562	10,299	18,539	20,599	16,479	8,240	**83,426**
$B_{p,y}$	t wood	432	1,070	2,183	3,970	7,802	8,803	7,682	4,115	**36,057**
$PE_{p,y}$	tCO2e	565	1,398	2,852	5,186	10,192	11,501	10,036	5,376	**47,105**
ER_y	tCO2e	**671**	**1,074**	**2,710**	**5,114**	**8,347**	**9,098**	**6,443**	**2,864**	**36,321**

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Year	Estimation of project activity emission (tCO_2)	Estimation of baseline emissions (tCO_2)	Estimation of leakage (tCO_2)	Estimation of overall emission reductions (tCO_2)
Year 1	565	1,236	0	671
Year 2	1,398	2,472	0	1,074

Year 3	2,852	5,562	0	2,710
Year 4	5,186	10,299	0	5,114
Year 5	10,192	18,539	0	8,347
Year 6	11,501	20,599	0	9,098
Year 7	10,036	16,479	0	6,443
Year 8	5,376	8,240	0	2,864
Total (tCO_2)	**47,105**	**83,426**	**0**	**36,321**

B.7 Application of a monitoring methodology and description of the monitoring plan as per the existing or new methodology applied to the micro-scale project activity:

B.7.1 Data and parameters monitored:

Data / Parameter:	**$fNRB_y$**
Data unit:	Fractional non-renewability
Description:	Non-renewability status of woody biomass fuel in year y
Source of data to be used:	CDM default value, https://cdm.unfccc.int/DNA/fNRB/index.html
Value of data	70%
Description of measurement methods and procedures to be applied, inc. frequency:	In line with the provisions of AMS II.G and the guidance of the CDM Executive Board (EB90) a default country-specific fNRB value of 70%, as approved by the Cameroonian DNA on September 22, 2014 shall be applied. The NRB value may be updated periodically, either in line with the respective updates of the CDM default value or through a dedicated NRB assessment as per the TPDDTEC methodology.
QA/QC procedures to be applied:	n/a
Any comment:	n/a

Data / Parameter:	$P_{p,y}$
Data unit:	kg/household/day
Description:	Quantity of air-dry fuelwood consumed by households in the project scenario p per day in year y
Source of data to be used:	Project PFT, Project PFT updates
Value of data	3.4687
Description of measurement methods and procedures to be applied, inc. frequency:	To be updated every two years. 3-day kitchen performance tests (KPTs) in a simple random, age-representative sample of project households per the guidelines of Annex 4 of the TPDDTEC methodology.
QA/QC procedures to be applied:	All records will be stored electronically and on paper. All steps of the statistical analysis will be documented, so that they can be reproduced at any time.
Any comment:	A single project fuel consumption parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

Data / Parameter:	$U_{p,y}$
Data unit:	Percentage
Description:	Cumulative usage rate for HRCs in project scenario p during year y, based on cumulative installation rate and drop-off rate
Source of data to be used:	Usage survey
Value of data	**Year 1**: 80%; **Year 2**: 64%; **Year 3**: 72%; **Year 4**: 73%; **Year 5**: 66%; **Year 6**: 65%; **Year 7**: 58%; **Year 8**: 51%
Description of measurement methods and procedures to be applied, inc. frequency:	To be updated annually. Survey in a simple random, age-representative sample of project households. The minimum sample size will be a total of 100 and 30 per age group.

QA/QC procedures to be applied:	All records will be stored electronically and on paper. All steps of the statistical analysis will be documented, so that they can be reproduced at any time.
Any comment:	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

Data / Parameter:	**$N_{p,y}$**
Data unit:	Days
Description:	Project technology-days in the project database for project scenario p through year y
Source of data to be used:	Total sales record
Value of data	
Description of measurement methods and procedures to be applied, inc. frequency:	PCI will continuously record the sales of HRCs, including date of sale, model/type and name and contact details (address, mobile phone where available) of users. The value for project technology-days in the project database for a project scenario p for year y is then established as the sum of the number of days of operation all HRCs of model/type p within the year y (or the applicable monitoring period). The number of days of operation of any HRC that has been sold before year y (or the applicable monitoring period) shall be 365 (or the number of days in the applicable monitoring period). The number of days of operation of an HRC that has been sold within year y (or the applicable monitoring period) shall be the number of days within year y (or the applicable monitoring period) since the date of sale of the HRC.
QA/QC procedures to be applied:	All sales records will be stored electronically and on paper.

	Year 1	Year 2	Year 3	Year 4
Wonder Cookers deployed	480	-	1,200	1,600
Cumulative number of WCs in operation	480	480	1,680	2,800
$N_{p,y}$(in thousands)	87.6	175.2	394.2	730
	Year 5	**Year 6**	**Year 7**	**Year 8**
	1,600	1,600		
	4,400	4,800	3,200	1,600
	1,314	1,460	1,168	584

Any comment:	The total sales record is divided based on project scenario to create the project database.

Data / Parameter:	**$LE_{p,y}$**
Data unit:	tCO2e per year
Description:	Leakage in project scenario p during year y
Source of data to be used:	Leakage assessment
Value of data	0
Description of measurement methods and procedures to be applied, inc. frequency:	To be updated every two years per the provisions of section II.6 of the TPDDTEC methodology. Where appropriate, elements regarding leakage may be included in the yearly monitoring survey.
QA/QC procedures to be applied:	In cases where survey methods are used: All records will be stored electronically and on paper. All steps of the statistical analysis will be documented, so that they can be reproduced at any time.
Any comment:	Aggregate leakage can be assessed for multiple project scenarios, if appropriate.

B.7.2 Description of the monitoring plan:

1. Monitoring Procedure

A. Total Sales Record

PCI will maintain a sales record, both in hardcopy end electronically.

The dataset collected and stored for each HRC sold will include at least:

1. HRC serial number (unique identifier)
2. Date of sale
3. Place of sale
4. HRC model
5. Name, telephone number (if available) and address of the buyer and/or user
6. Current stove technology/ies and cooking fuel/s of the buyer's/user's household

Since the target group under the baseline scenario are only rural and peri-urban households that use fuelwood as their primary energy source for cooking other types of buyers/users will not be included in the sales record of the carbon project. However, PCI may sell HRCs to non-project households, e.g. households who cook primarily on gas or kerosene or households outside the project boundary, in order not to discriminate interested buyers. Such devices will then not be entered into the project's sales record and the related emission reductions will not be claimed.

B. Project Database

The project database is derived from the total sales record. HRCs in the project database will be differentiated by their project scenario (if applicable). Based on the results of the Usage Surveys (US) PCI may decide to remove certain age groups from the database. At the time of writing of the PDD this is expected to happen after an operational time of 3 years for a given age group. However, a different cut-off age may be found to be appropriate eventually.

Furthermore, the HRCs in the project database will be differentiated regarding their participation in sample monitoring, e.g. in case the master sample approach described below is followed.

PCI may update records in the database as part of routine data maintenance and quality control measures. For instance, user, address, contact or baseline technology/fuel details may be updated in cases where e.g. households move or users let their HRCs to another household.

C. On-going Monitoring Studies

Three types of surveys will be performed periodically by the project proponent with the frequencies given in Table 3 in section B.6.1:

a) Monitoring Surveys
b) Usage Surveys
c) Project Performance Field Test (FT) updates

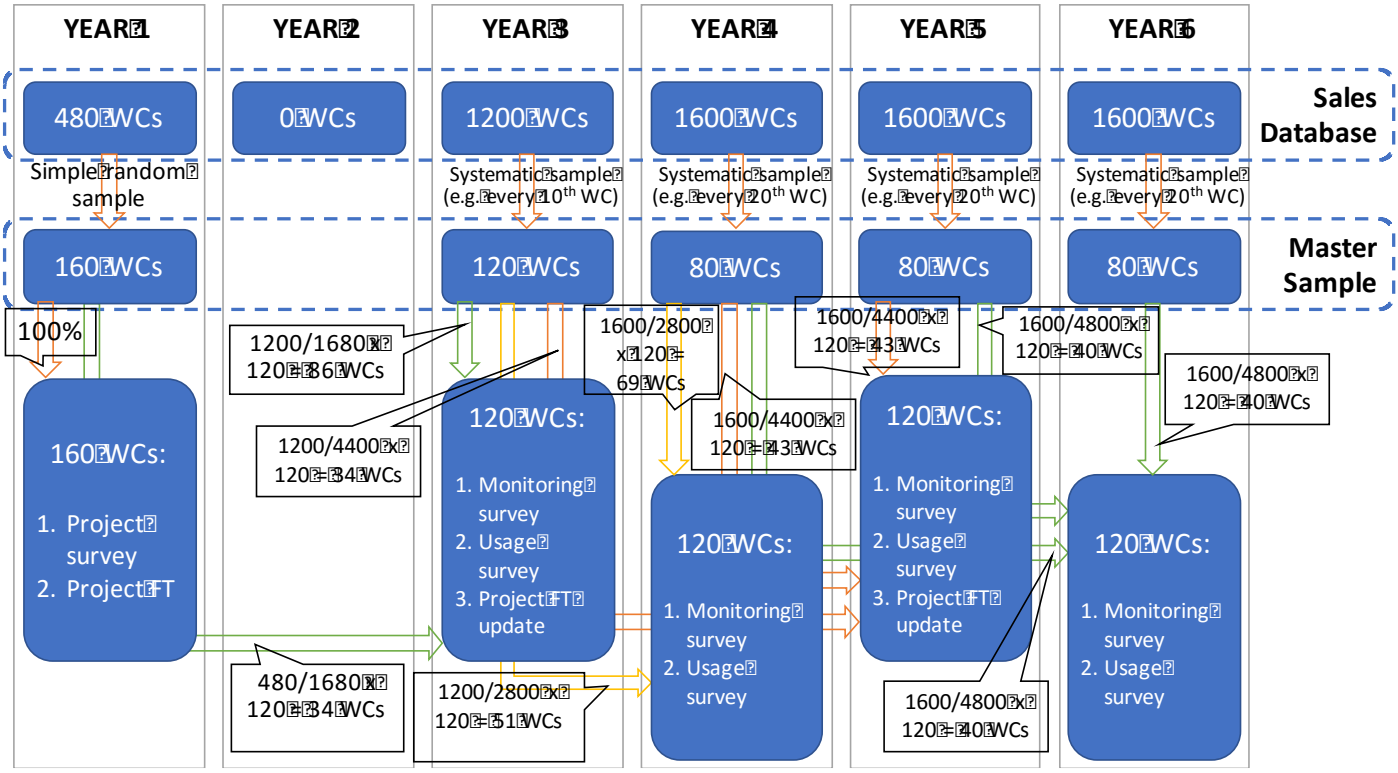
To keep monitoring effort and costs low, in a given year all pertinent surveys for a project scenario will be performed on the same sample. Any sampling approaches as per the TPDDTEC methodology may be used to draw the sample.

One possible approach for drawing a random, age-representative sample that helps to reduce the sampling effort and increase the response rate of the surveys makes use of a master sample drawn during the sales process. The respective sampling procedure then consists of two main steps:

1. Random drawing of a master sample (for each project scenario) during the sales process – most likely through systematic sampling – stratified by age groups.
2. Yearly random drawing of an age-representative sub-sample from the master sample.

An overview of this indicative sampling scheme and sample calculations for the size and the composition of the yearly monitoring samples per the projected sales figures of the project activity are presented in Figure 5 below. It considers that for the Wonder Cooker age group of Year 1, that were sold during the pilot activities of the project and for which retroactive emission reductions are claimed, the sampling approach to draw the age group's master sample was simple random sampling.

Figure 5: Overview indicative sampling scheme + sample size and composition example



It is also important to note that, although all surveys are performed on the same sample, the survey team may decide to stop one or the other survey when a sufficient number of HRCs to reach the target participation and/or precision for that survey has been reached.

In addition to the general sampling procedure described above the following approaches will be applied for the three surveys that are performed on the common sample:

a) Monitoring Survey (MS)

The information gathered through the MS shall include:

1. User follow up
    a. Update of address or location (if applicable)
    b. Update of mobile telephone number (if applicable)
2. End user characteristics
    a. Number of people served by baseline and project technology
    b. Typical project technology usage patterns and tasks
3. Project technology and fuels

a. Types of project technologies used and estimated frequency
b. Types of fuels used and estimated quantities
c. Sources of fuels; (purchased or hand-collected, etc.) and prices paid or effort made

b) Usage Survey

The usage survey provides a single usage parameter that is weighted based on drop off rates that are representative of the age distribution for project technologies in the total sales record.

The minimum total sample size will be 100, with at least 30 samples for HRCs of each age group. The majority of interviews will be conducted in person and include expert observation by the interviewer within the kitchen in question. After conclusion and analysis of the in-person interviews the same interviewers will conduct the remaining interviews via telephone.

Based on the progressive usage surveys PCI will establish a useful lifetime for each HRC type. HRCs that are olderwill be removed from the project database and no longer credited.

c) Project Performance Field Test (FT) Update

The Project FT Update will consist of 3-day Kitchen Performance Tests (KPTs) in line with the guidance provided in Annex 4 of the TPDDTEC methodology. Therefore, daily variations will be considered as per the design of the survey. Per the literature review performed by the University of Buea in the context of their study on household fuelwood consumption in the project area seasonal variations do not exist. Hence, the Project FT Updates may be performed at any time of a given year.

Prior to performing the KPTs the enumerators shall make it explicit to households that they must behave and consume fuel normally, to use those cooking devices (including all kinds of primary and secondary stoves as well as the HRCs) that they normally use and to cook typical meals during the 72 hours of the tests. On the other hand, the enumerators shall explain to households that unusual cooking events, such as parties or other extracurricular events of the household, should be avoided.

According to the provisions of “Case of a Single Sample Test” the Project FT Updates shall be analysed as a single data set, independently from the baseline default value. According to the TPDDTEC methodology and depending on the precision achieved by the field tests either the 90/10 rule as per Option a. of the “Case of a Single Sample Test” statistical requirements or the 90% confidence rule as per Option b. shall be applied to determine the target parameter $P_{p,y}$ (“mean daily fuelwood consumption per household”).

d) Baseline Performance Field Test (FT) Update

Since, the “Case of a Single Sample Test” methodological approach is followed no Baseline FT Updates are required.

e) Leakage Assessment

Every two years the leakage assessment will be updated per the provisions of section II.6 of the TPDDTEC methodology. Where appropriate, elements regarding leakage may also be included in the yearly monitoring survey.

f) Non-Renewable Biomass Assessment Update

The NRB value may be updated periodically, either in line with the respective updates of the CDM default value or through a dedicated NRB assessment as per the TPDDTEC methodology.

3. Quality Assurance and Quality Control

PCI will keep both paper and electronic copies of all monitoring information, especially of the data collected through sales records and monitoring studies. With regard to the sales records PCI will strive to obtain extended contact details of buyers/users of the HRC, including names and telephone numbers of other members of the household or emergency contact persons, wherever possible. Furthermore, PCI may periodically perform data maintenance and quality control campaigns, e.g. via follow-up phone calls, especially for households in the master sample (if this sampling approach is adopted). Through these campaigns false information and records in the database may either be updated or deleted.

Full documentation will also be kept regarding the production of HRCs and the sourcing of materials, including purchase invoices/receipts, production records, warehouse and production center logs.

B.8 Date of completion of the application of the existing or new baseline and monitoring methodology and name of the responsible person(s)/entity(ies)

Date of completion: 15/11/2016

Entity/person responsible:

Bridge Builders UG

Mr. Ole Meier-Hahn

www.bridge-builders.de

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/07/2015

C.1.2. Expected operational lifetime of the project activity:

10 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

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C.2.1.2. Length of the first crediting period:

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C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2015

C.2.2.2. Length:

10 years

SECTION D. Stakeholders' comments

D.1. Brief description how comments by local stakeholders have been invited and compiled:

The project is applying for retroactive registration. A formal local stakeholder consultation according to GS requirements was not performed. On the other hand, PCI conducted various surveys and meetings with the target group of the project, seeking feedback both on the HRC technology as well as on its social and economic impact. Through these consultations PCI gained a wealth of feedback and insight into the needs and concerns of the potential users of the HRCs, which was all taken into account for the design of the technology, as well as the project as a whole. Table 6 below provides an overview of the stakeholder consultation activities, the timing and the stakeholders that were involved.

Table 6: Consultations with stakeholders before and during the project's pilot phase

Activity	Time period	Description	Consulted stakeholders

Initial user feedback survey	08/2013	Prior to the project a test with 4 imported HRC bags was conducted in rural Buea and peri-urban Douala-Bonaberi during the month of August 2013. Nineteen households successfully participated in the test and their feedback was collected using a standardized questionnaire.	19 representative rural and peri-urban households
Baseline survey	07-10/2015	In 8 rural and 8 peri-urban areas meetings with women groups were organized according to their socio-economic representativeness for the respective subdivision. During the meetings the heat-retaining bag technology was demonstrated to women and their feedback was collected informally. Out of the participants of the women group meetings a total of 480 households (30 per group) chose to participate in the pilot phase of the carbon project through purchase of an HRC (i.e. "Wonder Cooker"). Out of these 185 were chosen randomly (at least 10 per area) as participants for a structured qualitative baseline survey before the deployment of the HRC. The questionnaire contained the following sections: A – Survey References: identification (households, WCB, interviewee and Interviewer). B - Basic Household Information: housing, household composition, income levels and activities and social status of the household C - Energy Sources: household energy mix and means of acquisition D -The Kitchen: cooking places, type of stoves used and their seasonal variations E - Cooking Habits- type of cooking and frequency, priority dishes and time used for cooking, degree of stove usage (primary/secondary stove) and problems encountered with stove. F -The Wonder-Cooking-Bag: household expectations before the usage of WCB. (Also see section B.6.1, 4.B)	185 households

Project survey	03-05/2016	8 months later a follow-up survey was conducted in the same households. The same questionnaire with the aforementioned sections was adapted to include the experiences of Wonder Cooker users, suggestion on improvement on the bag and community perception on its subsequent vulgarisation in the project area. (Also see section B.6.1, 5.B)	171 households
Continuous consultations with Bread for the World	01/2013-11/2016	Throughout the preparation and development of the project PCI consulted continuously with its funding partner BftW with regard to its sustainability. Amongst other things BftW encouraged and supported PCI to conduct the surveys on the social and economic impact of the project above. BftW also provided its own feedback, especially regarding the potential environmental impact of polystyrene used in the Wonder Cookers as insulation material.	Bread for the World climate change officer and others

D.2. Summary of the comments received:

Table 7 below summarizes the comments received during the various surveys and consultations with stakeholders of the project. The relevance of critical comments or suggestions with regard to the improvement of the project are discussed in greater detail.

Table 7: Comments received during the various consultations and assessment thereof

Activity	Comments received	Assessment of comments

Initial user feedback survey	Generally positive: All test users expressed their interest to purchase a Wonder Cooker when they become available. All the test-households conceded the heat retaining bag could positively change their day to day routine. They mentioned the following advantages: • Time savings: The food can be cooked while the user is doing something else in or completely outside the household. • Money savings: The expenses on cooking fuels will drastically reduce. • Reduced effort: Women and children collecting and transporting wood on their back from the farm will use the wood for a longer period. • Improved health: The users are less exposed to heat and smoke while cooking • No risk of fire: There is no risk of fire cooking with the bag while absent from the household. • Also the food doesn't burn when using the bag; therefore more food will be available for the family. The main disadvantages recorded were: • Not all types of food can be cooked inside the bag. • The timing of introducing and removing the pot from the bag is a crucial issue. This is particularly valid for beginners and inexperienced users. • Once the pot had been inserted into the bag, it becomes difficult to open and add water or condiments into the food. Two respondents expressed their fears on the fact that the food cooked inside the bag could be dangerous for their health. They suspected there could be some harmful chemical products inside the bag that actually cook the food. The most amazing fear encountered was in rural Buea where a respondent conceded her children and the neighbors refused to eat the food cooked from the bag because it was sorcery. The main suggestions for improvement of the bag were: • Increase the size of the bag • Use of a stronger and long lasting fabric to sew the external part of the bags. • Closing, i.e. tying the bag after inserting the pot, should be made easier. • Add a removable black fabric inside the bag to avoid the pots	The observed disadvantages and suggestions for improvement of the bags were valid. On the other hand, the identified issues concerned only the usability of the bags, not their sustainability in terms of social, environmental or economic impact. The concern with regard to chemicals used in the bags to cook the food was not entirely accurate, since no chemical reaction is involved in the cooking procedure. However, the insulation material polystyrene is a chemical product and it is important to understand if it may have any adverse effects on the health of users. The fear of sorcery expressed by one household is of course pointless from a scientific point of view. Nevertheless, it is important to understand the cultural context of users and take their concerns serious.

Baseline survey	• Based on the demonstration of the Wonder Cooker bags during the women group meetings users had mostly positive expectations from the bag: ○ 94% expected to save cooking fuel. ○ 77% expected to save money. ○ 96% expected to save time. ○ 75% expected a more comfortable cooking experience. ○ 80% expected that cooking would become more convenient within their daily routine. ○ 35% expected a higher prestige within the community for using the innovative bag. ○ Other mentions were an improved cooking hygiene, a reduction in smoke, less burning of food and less incidents of fire in the household. • Uncertainties and fears expressed by the users were: ○ 25% were worried that their peers might criticize them for using an uncommon cooking device. ○ 15% expected that the bag would be difficult to maintain or clean. ○ 6% expected difficulties with the handling of the bag. ○ 5% were worried the meals might have a different taste. ○ Similar to the initial survey a few people were skeptical about the bags out of superstition (sorcery). • The expectations of people regarding the longevity of the bags were rather diverse. Most people (47%) expected a lifetime of 1 to 5 years. Another 38% expected the bags to last 6 to 10 years. The rest expected lifetimes beyond 10 years, in a few extreme cases even beyond 20 years.	• Uncertainties and fears expressed by the users: The doubts of users were mostly with regard to the handling of the bags and the potential criticism of peers. Therefore, these comments were valid and should be considered for the success of the project, but they did not point to any material issues regarding its sustainability. • The rather high expectation on the lifetime of bags indicated on the one hand that users see the bags as an important investment and are likely to maintain them well. On the other hand, users might overestimate the lifetime of bags, which eventually may cause frustrations.

Project survey	• According to users observations, the consumption of cooking fuels is greatly reduced by the use of WCBs, especially for firewood (- 61%) and gas (- 25%). There are also substantial financial savings for most households, especially in peri-urban areas (69% on firewood and 44% on gas) where people do not collect firewood but rather purchase it and where the use of gas stoves as a secondary stove for warming up food is more common. • Households provided the following positive observations/experiences from using the bags: ○ 99% saved cooking fuel. ○ 78% saved money. ○ 98% saved time. ○ 75% reported a more comfortable cooking experience. ○ 92% reported cooking had become more convenient within their daily routine. ○ 61% perceived that their prestige within the community had increased because of the bag. ○ 38% felt that meals cooked with the bag tasted better than before. • 85% of users experienced a positive change of their lifestyle thanks to the Wonder Cooker bags. The most frequently reported changes were: ○ having more time for other activities like farming, attending to business customers, etc., run long distant-errands while cooking ○ sell and/or eat warm food at pace ○ save money from fuel savings which could be used to supplement foodstuff ○ facilitate the cooking of hard food ○ make cooking more flexible even at night while sleeping ○ facilitate cooking and conservation of warmth during celebrations • A small share of users reported difficulties with the bag: ○ 6% were criticized by their peers for using the bag. ○ 2% found the bag difficult to maintain or clean. ○ 2% had difficulties with the handling of the bag. ○ 1% felt that meals had a different (worse) taste	• Difficulties with the bag: The small size of the bag for big pots, difficulties with the estimation of cooking time, maintenance and handling of the bag were all valid comments with regard to the usage and should be considered to secure the success of the project. But again, they do not point to any material issues regarding its sustainability. • In the same vein users' suggestions for improvement and the observed damages of the bags are welcome feedback and should be taken into account for the further improvement of the project. • Lifetime expectations: see above • Inappropriateness of some dishes for cooking in the bag: This issue relates to the working principle of the HRC technology that is not compatible with some cooking techniques. Although the observation is

Continuous consultations with Bread for the World	BftW's main concern from the beginning and throughout the project was to gather feedback from users as early and often as possible, which encouraged PCI also in conducting the three surveys above. In addition to the issues brought up by the users, BftW provided valuable input regarding the environmental integrity of the project, most importantly with respect to the sustainability of polystyrene. The two concerns expressed were: 1. Is there a possibility that users will dump the Wonder Cooker bags at the end of their lifetime in an uncontrolled manner? If yes, can it be prevented that the non-organic, non-degradable material polystyrene ends up in the environment? 2. Old varieties of polystyrene contain the flame retardant Hexabromocyclododecane (HBCD), which – due to its persistence, toxicity, and ecotoxicity was listed in Annex A of the Stockholm Convention on Persistent Organic Pollutants in May 2013. Is the polystyrene used in the project HBCD-free?	The concerns with regard to the environmental harm that may be caused by polystyrene and the toxicity of HBCD were relevant and PCI did consider them for the design of the project.

D.3. Report on how due account was taken of any comments received and on measures taken to address concerns raised:

Table 8 gives an overview of the changes to the project design and measures taken by PCI to take into account those comments or suggestions for improvement of the project that were found to be valid.

Table 8: Summary of measures and changes to the project design in response to relevant critical comments or suggestions for improvement

Comment	Changes to the project design to address comment

Suggestions on design improvement of the Wonder Cooker bags	For the 480 bags that were produced for the pilot phase of the project PCI took into account most of the suggestions received during the initial survey: • A stronger fabric was used for the outside of the bag • An even stronger (jean) fabric was used for the inner base of the bag • A cord stopper was introduced to facilitate the easy tying of the bag • A removable black cloth was introduced to protect the inside from stains Further improvements will be made for the 3rd generation of Wonder Cooker bags that is going to be produced for the upscaling phase of the project: • All seems will be reinforced with double-stitching. • Smoother ropes made of tensile fabric for tying the bags will be used. • Bag identification numbers will be stitched instead of printed. • Darker fabrics will be used.
Concerns with regard to the size of the bags	The size of the 3rd generation of Wonder Cooker bags will be slightly increased, so that pots up to the second biggest of the common sizes in the project area can fit. However, the suggestion for a second bigger size version of the Wonder Cooker that can even fit the biggest pots on the market is deliberately not considered – at least in the first years of the project, in order to keep the complexities of production, sales, distribution and monitoring low. These huge pots are typically used for special occasions or by people who cook food for sale. Regarding the former the lost opportunity for reducing emissions is not very significant because of the scarcity of these events. The latter are not the target group of the project. In this context it is important to note again that HRCs are not a replacement for traditional cooking devices but a complement that helps to reduce the consumption of fuelwood and other cooking fuels. If certain meals are not cooked in the HRC emission reductions might be slightly lower but the overall effect of fuelwood saving is not compromised. The GHG integrity is safeguarded by monitoring the fuelwood consumption of households in the project directly through Kitchen Performance Tests (KPTs).

Difficulties with the handling of bags	Through the surveys we did realize that some users may have difficulties with the handling of the cooking bags and the new way of cooking food, such as timing the duration of the cooking pot inside the bag or avoiding opening the bag when operating. In order to avoid this situation as much as possible PCI will provide intensive training on the usage of the bags during sales. PCI will establish a number of focal points (e.g. local shops), which are able to provide all information about the functioning of the bags. Also, there a phone call back service is established that enables any user who has difficulties to use the bag to just dial PCI's customer service number provided on the sales receipts and PCI calls them back. In the framework of carbon monitoring PCI will also follow up regularly by phone on their own initiative. These measures contribute to build a strong customer proximity and help users to master cooking with the bag with ease. Furthermore, PCI is evaluating the possibility to implement a you're your money bag" policy, refunding users their money and collecting the bags from them in case they do not use them. This should be done within a period of six months starting from the date a bag was purchased. Such a service would not only increase the credibility of the Wonder Cooker as a product but would also avoid frustrations of users who despite of all training do not manage to handle the WC.
Cultural concerns ("sorcery", "poisonous")	The main strategy PCI uses to overcome cultural concerns of users is the intensive training on the usage of the bags, sensitization about the new technology and follow up with users by putting a good after sale service in place, notably the call back system and focal points mentioned above.

Environmental impact of polystyrene	The potential for a negative environmental impact of the project due to the facts that users may dump old bags into the landscape in an uncontrolled fashion at the end of their lifecycle is real. The ideal solution to this issue would be to have a substitute insulating material which is more environmentally friendly and which can replace polystyrene but thereby having the same characteristics like polystyrene in terms of durability, availability and high insulation capacity. In this vein, PCI realized an experiment by using cotton balls to produce a heat retaining cooking bag in 2015 but the result was mediocre. PCI will however continue searching for and testing alternative insulating materials which can be as perfect as polystyrene. In the absence of this ideal case as of now, recycled polystyrene plates that are disposed in waste bins or in the environment by companies and businesses is a better alternative to implement the project. They could be collected and crushed to obtain polystyrene beads, instead of buying them directly from the polystyrene producing firm in Douala. Like this no additional potentially environmentally harmful substance would be generated because of the project. This option of recycled polystyrene was envisaged during the pilot phase where a small polystyrene crushing machine was conceived and manufactured. We collected and crushed 64 kg of polystyrene which enabled the production of 64 bags among the 480 bags of the pilot phase. This activity led to the understanding that recycled polystyrene is a rare product. There are “recycling competitors” already operating and very active in big cities of the project area (Douala, Buea, Limbe, Kumba, Bafoussam, Dschang). E.g., recycled polystyrene is used to produce varnish for the local furniture industry. Through discussions with bigger collectors in Douala it became clear that sourcing recycled polystyrene would create a bottleneck for the production of Wonder Cookers, since a continuous supply of the required quantities could not be guaranteed. Therefore, at least in the first year of the upscaling phase of the project, it will not be feasible to source recycled polystyrene. Eventually, once the project is running smoothly PCI will reevaluate the situation and may still be able to source polystyrene exclusively from recycling. In the absence of a more environmentally friendly insulation material PCI is taking measures to mitigate the environmental impact of polystyrene used in the production of the bags – be it new or recycled: The first measure is the collection of damaged or old bags from the users to produce new bags with the polystyrene beads (re-use). The second measure is to work in close collaboration with varnish producers and other polystyrene recyclers to recycle polystyrene from damaged or old bags. More concretely, PCI will communicate to users during the sales/distribution activities about the importance of returning the damaged or old bags. This can be done thereafter by using the call-back service or sending a text message to PCI’s phone number printed in the sale-agreement.

D.4. Report on the Continuous input / grievance mechanism:

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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	Comment book, including: date, explanation of problem or comment, what will the stakeholder like to see change/stay the same, response to the comment, channel through which the comment was received, resolution of issue Location of the comment book: Proclimate International's office in Buea Buea-Town, opposite Market 286 Buea, South West Region, Cameroon	The I/G Expression Process Book is the best practice approach recommended by the GS for the continuous collection and processing of stakeholder concerns. The format chosen is an augmented version of the GS's minimal requirements. The PCI office is the most appropriate location for the process book because it is the hub of PCI's activities in the region, well known to all stakeholders and well accessible by public and other local transport.

Telephone access	PCI's main line: +237 33323652 Office hours: Monday to Friday, 9:00 to 17:00	This is PCI's main number for customer and stakeholder service. The number was communicated to all stakeholders that were consulted during the GS Stakeholder Feedback Round and is also included in all advertisements and brochures of the HRC project. During office hours the phone is always attended.
Internet/email access	HRC project's service email: tsafack@pci-cameroon.org	This email address is communicated to all stakeholders that are consulted during the GS Stakeholder Feedback Round and is also included in all advertisements and brochures of the HRC project.
Nominated Independent Mediator (optional)	n/a	n/a

All issues identified during the crediting period through any of the Methods shall have a mitigation measure in place that should be added to the monitoring plan.

D.5. Report on stakeholder consultation feedback round:

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Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2 - **Information regarding Public Funding**