ONIL STOVES —GUATEMALA – USPANTÁN

Document Prepared by

C-Quest Capital Stoves Asia Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

- **A summary description of the implementation status of the technologies/ measures (eg, plant, equipment, process, or management or conservation measure) included in the project.**

  The project involves the distribution and installation of ONIL Stoves for use by households in Guatemala. Before the adoption of the ONIL Stove, households in Guatemala used inefficient, conventional open fire. The ONIL Stove is a fuel-efficient stove that reduces the amount of firewood required by households by up to 58%, compared to the baseline, and results in lower emissions based on its construction and design. A single ONIL Stove will save 9.01 tons of CO_2e per year.

  HELPS International A.C. is the implementer of this project. HELPS International A.C. manufactures the ONIL stoves and distributes them to communities throughout Guatemala.

  The project was included as the first CPA under CDM PoA entitled "ONIL Stoves — Guatemala – Uspantán" (CDM PoA reference number - 8480, CPA reference number – 8480-P1-0001-CP1).[1]

1) The first ONIL Stove was installed on 11 January 2010. Till the end of submission of PD, a total of 11,132 ONIL Stoves were installed under the project.

All the data recorded during stove registration process was captured via hard copy of registration card. The information collected is then transferred to a project database.

- **The relevant implementation dates (e.g., dates of construction, commissioning, and continued operation periods).**

CDM CPA inclusion

[1] https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/NQIZR3S1J58FLTHUKMB2X6PY07CE49/view?cp=1

Date of CPA inclusion into PoA	19-December-2012

Installation of ICS

Date of first ICS installed	11-January-2010
Date of last ICS installed in the database	11-August-2012

First Monitoring Survey

Survey dates for parameters n_y and SS_y	01-February-2017 to 28-March-2017
Survey dates for parameter $\eta_{new,y,i}$	28-February-2017 to 16-March-2017

Second Monitoring Survey

Survey dates for parameters n_y and SS_y	08-June-2018 to 11-June-2018
Survey dates for parameter $\eta_{new,y,i}$	15-June-2018 to 28-June-2018

Third Monitoring Survey

Survey dates for parameters n_y and μ_y	01-October-2020 to 31-October-2020
Survey dates for parameter $\eta_{new,y,i}$	29-September-2020 to 03-November-2020

- **An explanation of how the project is expected to generate GHG emission reductions or removals.**

  The replacement of conventional open fire with more efficient devices in households reduces the amount of fuel wood consumption through improved combustion efficiency, thus reducing the GHG emissions linked to non-renewable biomass and incomplete combustion of fuel wood.

- **The location of the project.**

  The project will take place in Guatemala. The details of the project location are provided in Section 1.12.

- **A brief description of the scenario existing prior to the implementation of the project.**

  The scenario existing prior to project initiation are the same as the baseline scenario. See Section 1.13.

- **Where applicable, describe how leakage and non-permanence risk factors are being monitored and managed for AFOLU projects.**

  Not applicable. The project is not a type of AFOLU project.

- **An estimate of annual average and total GHG emission reductions and removals for the project crediting period.**

  The average annual GHG emission reduction from the project is expected to be 100,287 t CO2e

1.2 Sectoral Scope and Project Type

The project is categorized under type/category as below:

a) Sectoral scope: 03 - Energy demand

b) Type: I – Energy efficiency improvement projects

The project is not a grouped project.

1.3 Project Eligibility

The project involves energy efficient cookstove distribution which falls under the category of efficiency improvements in thermal applications, therefore it is eligible under the scope of VCS Program.

1.4 Project Design

The project is a multiple project activity instance. Instances under this project consist of the distributed ICS with a thermal efficiency of at least 25% to household users cooking with non-renewable biomass in the baseline scenario.

Eligibility Criteria

The project is not grouped project,

1.5 Project Proponent

Organization name	HELPS International Incorporated
Contact person	Mr. Richard Grinnell
Title	Director of Stove Project and Vice President of International Development
Address	Calzada Atanasio Tzul 21-00 Zona 12, Complejo Empresarial El Cortijo II, Bodega 517, Guatemala.
Telephone	011(502) 2428-6600
Email	richardgrinnell@helpsinternational.com

Organization name	C-Quest Capital LLC
Contact person	Isabel Alegre
Title	Managing Director

Address	1015 18th Street NW Suite 730 Washington, DC 20036 United States of America
Telephone	+1 (202) 416-2400
Email	jalegre@cquestcapital.com

1.6 Other Entities Involved in the Project

Other entities are not involved in the development of the project.

1.7 Ownership

The project ownership is with HELPS International Incorporated.

1.8 Project Start Date

The start date of this project is 11 January, 2010, which is the date when ONIL stoves were first delivered (implementation) after the POA and its first CPA were published for Global Stakeholder Consultation at the UNFCCC website.[2]

1.9 Project Crediting Period

The first crediting period was from 20 December 2010 to 19 December 2020, ten years, renewable twice, but not extending beyond 31 December, 2034 when the maximum CDM crediting period expires[3]

This PD is being developed under the second crediting period in which will start from 20 December 2020. After the initial crediting period of ten years, subsequent renewals of the crediting time may be considered depending on the status of the project activity and baseline revision at that time.

Second crediting period: 20 December 2020 to 19 December 2030; both dates included.

[2] As per paragraph 3.19.7 of VCS Standard Version 4.1, "for projects registered under the CDM as a Program of Activities (PoA), each Component Project Activity (CPA) shall be registered with the VCS Program as a separate project accompanied by its associated Program of Activities Design Document… The project start date for such projects is the date on which the first activity under the Program of Activities began reducing or removing GHG emissions".

[3] At the time of registration of this project under VCS, the applicable version of VCS standard was version 3.7 and in accordance with the VCS standard version 3.7 paragraph 3.8.1 that states "For non-AFOLU projects and ALM projects focusing exclusively on reducing N2O, CH4 and/or fossil-derived CO2 emissions, the project crediting period shall be a maximum of ten years which may be renewed at most twice." Paragraph 3.8.3 of the standard mentions "Projects registered under other GHG programs are not eligible for VCU issuance beyond the end of the total project crediting period under those programs. For example, a CDM project with a seven year twice renewable project crediting period is not eligible for VCU issuance beyond the end of those 21 years".

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	100,287
Year 2	100,287
Year 3	100,287
Year 4	100,287
Year 5	100,287
Year 6	100,287
Year 7	100,287
Year 8	100,287
Year 9	100,287
Year 10	100,287
Total estimated ERs	1,002,870
Total number of crediting years	10
Average annual ERs	100,287

1.11 Description of the Project Activity

The ONIL Stoves will involve the distribution and installation of ONIL Stoves for use by households in Guatemala. Before the adoption of the ONIL Stove, households in Guatemala used inefficient, conventional open fire. HELPS International manufactures the ONIL stoves and distributes them to communities throughout Guatemala. The ONIL Stove is a fuel-efficient stove that reduces the amount of firewood required by households by up to 58%, compared to the baseline, and results in lower emissions based on its construction. A single ONIL Stove will save 9.01 tons of CO_2e per year.

Since the efficiency of a traditional open fire is 10% and the efficiency of an ONIL Stove is 31.67% and depending on the specific stove model the efficiency can be higher, the ONIL Stove is more efficient than the traditional open fire. Complete combustion and efficient energy transfer to pots and cooking surfaces ensures fast heating and fuel-efficiency. The fire is contained in the insulated combustion chamber, thus burning the oil vapor that is normally emitted as smoke. Energy is then efficiently transferred to cooking pots and surfaces. Insulation prevents the heat from being wasted heating the stove body. Hot gases that do not touch the cooking surface waste their energy, but insulation lets all the hot gases come in contact with the cooking surfaces thereby transferring their energy to the pot and leaving only enough heat in the exhaust gases to provide a draft up the chimney. These technology improvements make the ONIL stove more efficient than a traditional open fire.

The ONIL stove can be manufactured assembled and installed locally or be imported.

Technical Information of ONIL stoves[4]

Weight	394.32 lbs
Type of Fuel	firewood
Thermal efficiency	31.67%
Combustion speed	30.83 g/min
Fire Power	8930 watts
Material	Concrete & reinforced steel

[4] These specifications are indicative and actual specification of the stove may vary from the ones mentioned.

Figure 1: ONIL “Plancha” Stove made of concrete block with combustion chamber and griddle multi pot top

1.12 Project Location

Each SSC-CPA will contain a delineated set of households in which ONIL Stoves have been installed within Guatemala. (CPA Implementer) will record names of end-users and the exact location in the SSC-CPA in the program database. End-user names and locations and stove identification numbers will be collected on stove purchase contracts. The sum of the location of these households as within Guatemala, will define the spatial boundary of the SSC-CPA.

The key geographic location of the applied measure (improved cook stoves) is determined using the database of unique stove IDs, the household addresses, GPS coordinates and owners’ names and national ID card numbers. These parameters uniquely identify the household. The CPA boundaries equal Guatemala’s borders. The geographic coordinates for Guatemala, the CPA boundary, are: Northernmost point N 17° 48.744894' W 89° 9.902344 (Reserva de la Biosfera Calakmul), Westernmost point: N 14° 32.202449' W 92° 13.483887; Southernmost point: N 13° 45.280865'W 90° 7.910156 (Carretera del Litoral); Easternmost point: N 15° 43.469738' W 88° 13.872070(Carretera 13).

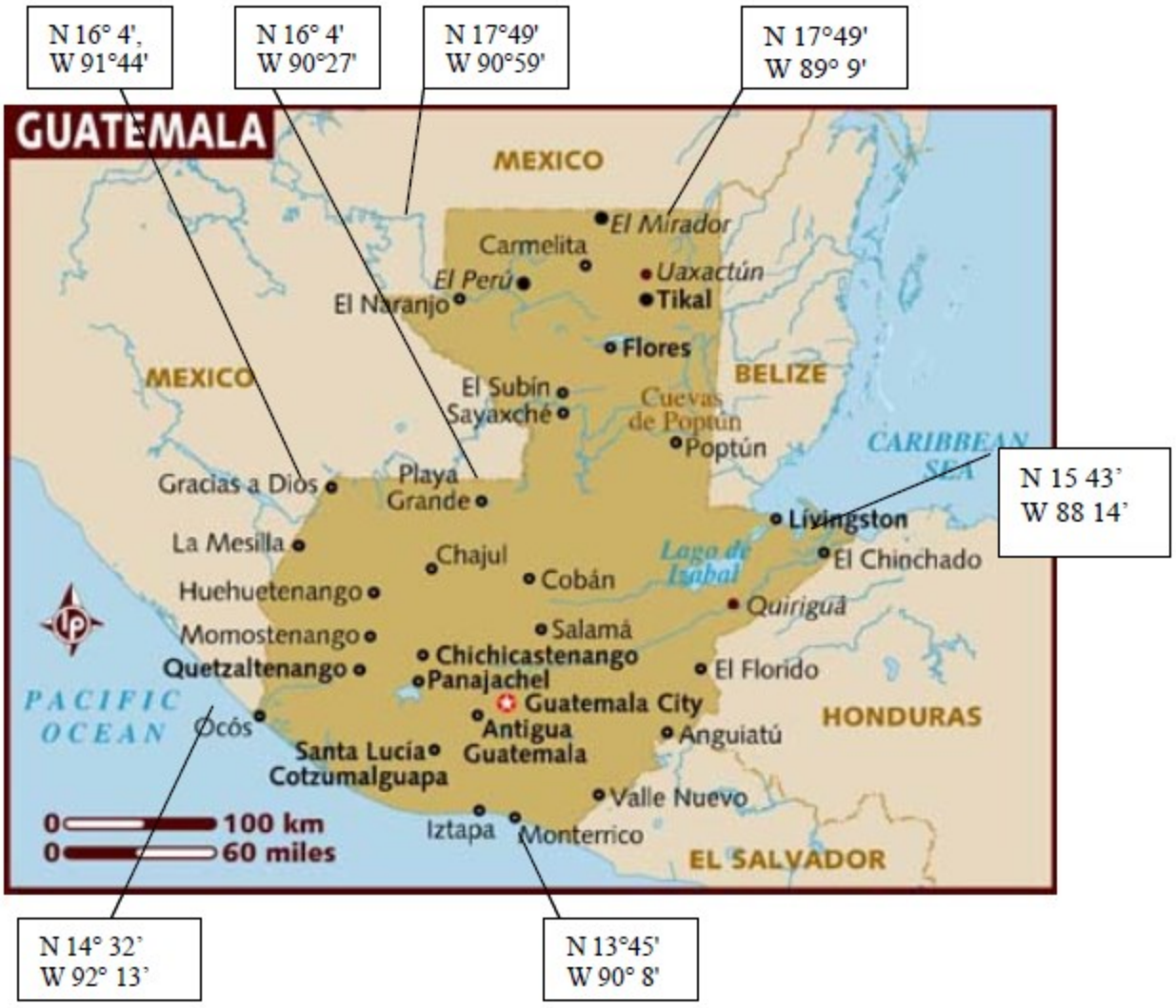


Figure 1. Map of Guatemala, Uspantán CPA[5]

1.13 Conditions Prior to Project Initiation

The conditions prior to project initiation are the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There are no laws and regulations governing the use of improved cookstoves in Guatemala. The project is a voluntary effort by the project proponent.

[5] www.lonelyplanet.com/maps/central-america/guatemala/map_of_guatemala.jpg

1.15 Participation under Other GHG Programs

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

"ONIL Stoves —Guatemala – Uspantán" is registered as a Small-Scale Component Project Activity under the Clean Development Mechanism (CDM) and under the Programme of Activities "Distribution of ONIL Stoves – Guatemala" (Ref. PoA 8480).[6]

1.15.2 Projects Rejected by Other GHG Programs

This project has not rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is not included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit.

1.17 Additional Information Relevant to the Project

Leakage Management

Not applicable as in accordance with the applied methodology VMR 0006 version 1.1 he project opts to apply a net to gross adjustment factor of 0.95 to account for leakages, thus no surveys on leakage are required.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

The following are contributions of the project to sustainable development:

Environmental sustainability

[6] CDM document can be accessed through:
https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/NQIZR3S1J58FLTHUKMB2X6PY07CE49/view (PoA) and
https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/Q158GU3XA9MFE0H2Z6OI4JTNDL7WRP/view (CPA 001)

(i) The project reduces the use of non-renewable biomass:

By adopting the higher efficiency ONIL Stove, households reduce the quantity of fuel wood they must consume for daily cooking needs. When compared to firewood consumption of conventional open fires, the ONIL Stove on average reduces firewood consumption by 58 percent. Since a very high proportion of fuel wood comes from non-renewable sources, this translates directly into reduced emission reductions from non-renewable extraction of wood.

(ii) The project also supports the objectives of national climate change policies and programs.

The Programa Nacional de Cambio Climatico (PNCC) within the Environment Ministry of Guatemala is charged with assessing the risks of climate change and recommending policies to reduce the country's vulnerabilities. The project is in line with the PNCC aim of generating projects within Guatemala that promote forest management, a critical and vulnerable sector identified by the Program. By installing improved cook stoves, households reduce firewood consumption, thus helping maintain forest stocks within the country.

Economic Sustainability

(i) The project reduces household expenditures:

The PoA will contribute significantly to Guatemala economic sustainability through the more efficient use of firewood. Energy savings at both individual household and national levels make important contributions to their economic efficiency and sustainability. The use of the ONIL Stoves will reduce firewood consumption by approximately 58 percent from baseline consumption, significantly reducing household expenditures. By installing improved cook stoves, these households would save significantly on household expenditures related to firewood purchases along with saving time spent gathering firewood, which would free up time for households for other income generating activities. These savings would help improve living conditions for households in Guatemala.

(ii) The project results in creation of new jobs and development of new skill sets:

The ONIL Stove distribution program, which all CPAs will follow, relies on community organizers to facilitate demonstrations and organize training sessions. As these community organizers increase their knowledge about stoves, they often become professional installers and help maintain the stoves in their community. As uptake of stove technologies spreads, it will allow for expansion of manufacturing facilities to meet increased demand, thus generating more employment opportunities within the country.

Social Sustainability

(iii) The project helps to improve health conditions:

There are very tangible and significant health benefits associated with the switch in technology from conventional open fires to improved cook stoves. Traditional cooking methods involve conventional open fires that result in the emissions of local pollutants such as carbon monoxide and particulate matter in often poorly ventilated rooms, which lead to respiratory problems. In addition, conventional open fires are frequent causes of burns and other injuries. Switching from conventional open fires to ONIL Stoves reduces the incidence of such injuries and health problems.

Further Information

No Any further information is required to be mentioned in this section.

2 SAFEGUARDS

2.1 No Net Harm

The project involves the distribution and installation of ONIL certified improved cook stoves to households in Guatemala which currently use mostly traditional open fire for cooking. The activities under the proposed project promote improved cook stoves that result in reduced fuel consumption and emissions due to cooking and heating water in homes. The ICS used in this project have characteristics that improve the efficiency of combustion and thermal transfer to the pot compared with three-stone fires or traditional pot support. Furthermore, traditional cooking methods involve open fires that result in the emissions of local pollutants such as carbon monoxide and particulate matter in often poorly ventilated rooms, which lead to respiratory problems. In addition, open fires are frequent causes of burns and other injuries. Switching from fireplaces to ICS reduces the incidence of such injuries and health problems. Therefore, the ONIL Stove installed under this project presents positive environmental impacts wherever they are applied, and no negative environmental impacts have been identified.

2.2 Local Stakeholder Consultation

The local stakeholder consultation was done at PoA level, prior to the registration of the PoA. The local stakeholder meeting for the POA was conducted in Agua Blanca, Quetzaltenango on 15 December 2009.

The outcomes from the local stakeholder consultation are available in Section F of the PoA-DD[7].

PP conducted regular spot checks to observe that project ICS were being used properly and to get feedback from stakeholders on ICS usage and its benefits. Also, registration card contains contact details of local PP representative through which ICS users can contact PP for any concerns /comments on the project or project ICS. If any stove part is damaged or missing, then PP representatives immediately arrange for replacement of missing/damaged parts.

No negative comment received during the ongoing communications with stakeholders

2.3 Environmental Impact

[7] https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/NQIZR3S1J58FLTHUKMB2X6PY07CE49/view?cp=1

No negative environmental impacts have been identified from the project and environmental impact assessment (EIA) is not required for the project.

2.4 Public Comments

The local stakeholder consultation was done at PoA level prior to the registration of the PoA under CDM. The outcomes from the local stakeholder consultation are available in Section F of the registered CDM PoA-DD[8].

2.5 AFOLU-Specific Safeguards

This project is non-AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1[9].

CDM Tools:

Tool 11 version 03.0.1 - Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period.

Tool 30 version 3.0 - Calculation of the fraction of non-renewable biomass

3.2 Applicability of Methodology

VMR 0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1

Applicability criterion	How the project complies
Project activities shall be implemented in domestic premises or in community-based kitchen	The proposed project involves deployment of ICS only in households.
The project stove shall have specified high-power thermal efficiency of at least 25% per the manufacturer's specifications and shall	ONIL stoves planned to be installed under this project are single pot wood cookstoves that have an efficiency of 31.67% as per the

[8] CDM-PoA-DD-FORM (unfccc.int)

[9] VMR0006 Methodology for Installation of High Efficiency Firewood Cookstoves - Verra

<table>
<tr><td>exclusively use woody biomass and can be single pot or multi-pot;</td><td>manufacturer's specifications.</td></tr>
<tr><td>Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics;</td><td>The baseline survey confirms that participants have been using non-renewable biomass since at least 31 December 1989. A comparison of Guatemalan household energy use by the national census[10] show that in 1981, 77.3% of households used firewood thus demonstrating that non-renewable biomass has been in use since 1989.
The following indicators listed in the methodology demonstrate that non-renewable biomass has been used since 1989.
1. Survey results, national or local statistics, studies, maps or other sources of information such as remote sensing data that show that carbon stocks are depleting in the project area;

As seen in the FAO 2010 report (data shown in the table below), carbon stocks in the country are depleting in the project area.[11]

<table>
<tr><td></td><td>1990</td><td>2000</td></tr>
<tr><td>Biomass Carbon Stocks (millions of metric tons of carbon)</td><td>365.2</td><td>323.6</td></tr>
</table>

2. Increasing trends in fuel wood price indicating scarcity of fuel wood;

An analysis comparing the Encuesta Nacional de Condiciones ENCOVI (Living Standards Measurement Survey) from national surveys taken in 2000 to 2006 show that the price of rural fuel wood consumption went up by 21.6% from 2000 to 2006.[12] Data from the national census also shows that the number of households using fuel wood for cooking has also</td></tr>
</table>

[10] Winrock, 2004, Partnership for Clean Indoor Air, Household Energy Indoor Air Pollution and Health: Overview of Experiences and Lessons in Guatemala, page 19.

[11] FAO, Evaluacion de los Recursos Forestales Mundiales, Informe Nacional, 2010, Guatemala, FRA2010/084, www.fao.org/forestry/20262-1-174.pdf, page 33

[12] Heltberg, Rasmus, September 7, 2010, Trends In Fuelwood Use And Scarcity In Guatemala, 2000-2006.

	increased from 889,899 in 1981 to 1,261,952 in 2002[13]and to 1,746,326 in 2006.[14]. Thus, it is reasonable to assume that the increasing trend in price also holds true for the time period since December 31, 1989, thus meeting the NRB indicator requirements.
For the specific case of biomass residues processed as a fuel (e.g., briquettes, wood chips	Not applicable. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.
Both 'Projects' and 'Large Projects' can use the methodology	In according to VCS standard, the proposed project comes under the category of 'Projects'.
The CDM-PoA-DD/CPA-DD shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g., programme logo).	The ICS is uniquely identified and defined in an unambiguous manner by a database of uniquely identified households in which ONIL stoves have been installed. Each ICS has been assigned a unique ID in the database, which is linked to information for each entry on the following: • Precise geographical / location identification of the household (using GPS or similar technology), • Stove serial number (unique identifier) • Name of the head of household, and • Stove model • Date of distribution/installation
The CDM-PoA-DD/CPA-DD shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices.	The stove manufacturers/wholesale providers/end users shall sign an undertaking stating clearly that the CME or an entity authorized by it shall be the sole owner of the CERs arising from the project.

Tool 11 - Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period

[13] Winrock, 2004, Partnership for Clean Indoor Air, Household Energy Indoor Air Pollution and Health: Overview of Experiences and Lessons in Guatemala

[14] *Instituto Nacional de Estadistica*, *Anuario Estadistico Ambiental 2008"*, National Statistics Institute, Environmental Statistics Yearbook 2008, Page 299 "

Applicability criterion	How the project complies
This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.	Stepwise approach hah described under section 3.4 of this PD
The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.	both the steps have demonstrated under section 3.4 of this PD

Tool 30 - Calculation of the fraction of non-renewable biomass

Applicability criterion	How the project complies
This tool may be used by: (a) DNAs to submit region- or country-specific default f_{NRB} values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or (b) project participants to calculate project- or PoA-specific f_{NRB} values.	Option (b) applied to calculate the project specific f_{NRB} value as described under section 3.4 of the PD.

3.3 Project Boundary

The project was included as a CPA under CDM PoA with CDM reference 8480-P1-0001-CP1, and according to paragraph 3.19.5 of the VCS Standard (Version 4.1), this section does not need to be completed.

3.4 Baseline Scenario

The baseline scenario would be the use of traditional cooking methods (i.e., open fires) using fuel wood in Guatemalan households prior to the replacement by improved cook stoves.

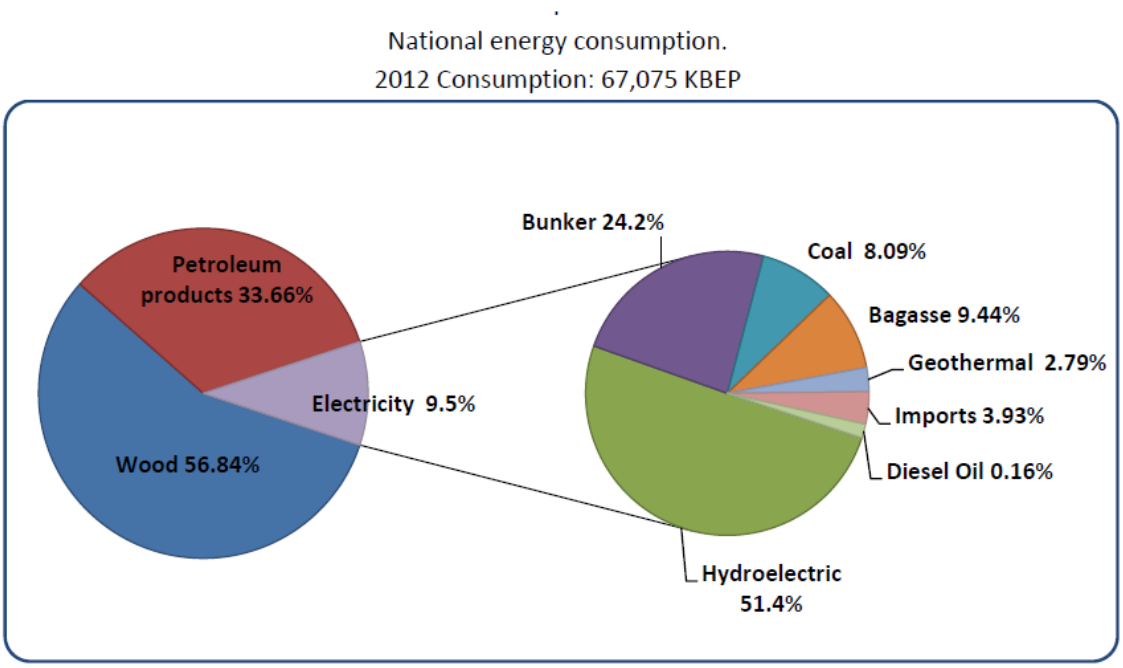
Application of Tool 11, for 'Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period' version 3.0.1

Step 1

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The current baseline "projected use of fossil fuels to meet similar thermal energy needs as those provided by the project devices" is in compliance with the relevant national and sectoral policies

The Ministry of Energy and Mines (MEM), as the ruling institution of the energy sector in Guatemala, updated the Energy Policy 2013-2027[15] with the aim to establish important guidelines to prioritize actions for sustainable development. The plan aims to promote the use of clean and environmentally friendly energy for domestic consumption without losing sight of energy security and the need for supplying electricity at competitive prices.



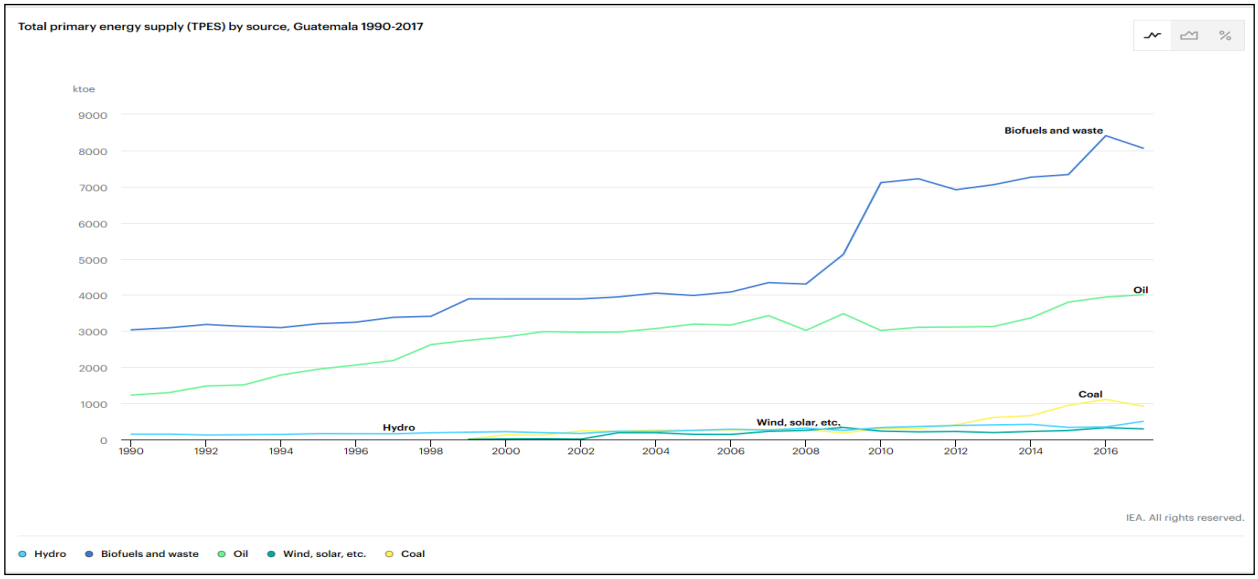
Source: General Direction of Energy. Ministry of Energy and Mines. Energy Statistics 2012.

According to the 2012 consumption figures as included in this policy, wood fuel dominated the energy demand scenario accounting for 57% of total energy consumption.

Step 1.2: Assess the impact of circumstances

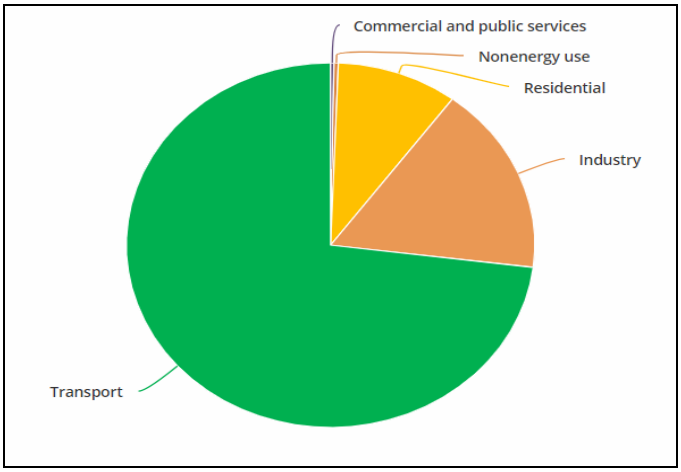
[15] Energy Policy 2013-2017; Presidency of the Republic of Guatemala Ministry of Energy and Mines

Guatemala shows high dependency on firewood, especially for residential demand. Along with being the main source of energy for household/residential across the country, biomass has also started to gain significant importance in meeting the continuously increasing energy demand.



Current Energy Mix[16]

Oil happens to be the second most important energy source in Guatemala



Guatemala's Different Sectorial Shares of the Final Consumption of Oil Products (IEA, 2018)[17]

Thus, Biofuel and oil continue to dominate the energy supply scenario in Guatemala over the past several years.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment

[16] https://www.iea.org/countries/Guatemala

[17] https://energypedia.info/wiki/Guatemala_Energy_Situation

is the most likely scenario for the crediting period for which renewal is requested.

Guatemala has a dedicated Firewood Commission to implement the National Firewood Strategy with the proposed action plan (i) to enhance access to efficient technologies, (ii) to increase demand, and (iii) to promote an enabling environment for sustainable and efficient firewood use; however more than 70% of the population in Guatemala continue to depend on wood fuel for their cooking needs with an average fuel collection time of 0.5 to 1.0 hour per day[18].

It is estimated that 16 million cubic meters of wood are annually consumed in Guatemala. Households cooking with wood (60 to 70%) lack of a suitable fireplace for smoke extraction. On the other hand, between 5% and 20% of families in extreme poverty cooked in the same room where they slept. Moreover, according to ECLAC (Economic Comission for Latin America and Caribbean), 72% of Guatemalan households used wood as an energy source for cooking, which represents a concern for the damage to health caused by smoke burning[19].

Thus, the current baseline of use of traditional stoves is still applicable.

Step 1.4: Assessment of the validity of the data and parameters

Data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the project crediting period and which are no longer valid have been updated.

Step 2

Step 2.1: Update the current baseline

The baseline emissions for the subsequent crediting period, have been updated based on the latest approved version of the methodology.

- Default IPCC values – Default IPCC values, other than ones defined in the methodology, have not been used and the ones specified in the latest version of the methodology are updated values.
- Emission factors, values and benchmarks- These have been updated in line with the latest version of methodology.
- The current baseline emissions have been updated for the subsequent crediting period Please refer to Section 5.2. for details.
- Data and parameters that were fixed ex-ante and which were not monitored have been updated in accordance with the requirements of the applied methodology VMR0006, version 1.1. Please refer to Section 5.1 for details.

Step 2.2: Update the data and parameters

Ex-ante Parameter	1st PoA Period	2nd PoA Period
$B_{old, i, j}$ (tons/year)	6.64	8.05

[18] https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf

[19] Energy policy 2013-2027

f_{NRB} (fraction)	0.913	0.7982

Determination of the average annual biomass consumption per household (B_{old}) (from Household Baseline Survey).

A household survey was conducted to determine the average annual use of fuel wood in households that are currently not using the ONIL Stoves.

As demonstrated by the survey, conventional open fires represent the majority of cooking methods used by households covered by the PoA

Baseline Survey Design

The target reliability levels were 90% confidence and 10% precision. The sampling effort took guidance from Standard for Sampling and Surveys of CDM Project Activities and Programme of Activities.

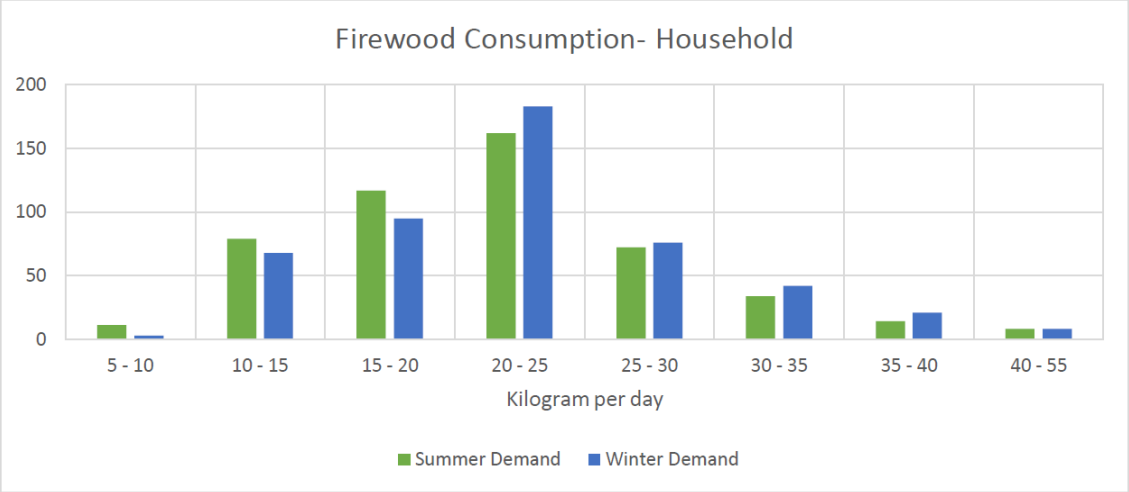
The local field partner first identified areas, where households selected through random sampling were located and it was ensured that the survey was not carried out in that locality during any festival or community celebration. Care was also taken to exclude any household that did commercial cooking in addition to domestic cooking.

Sampling Method

The sampling method used for this study is multi-stage sampling. This method is effective when travel times and costs between one locality and another can be substantial. It is also usually the most appropriate and commonly used design for household surveys of national coverage. In line with the Standard for sampling and surveys according to which, multi-stage sampling "combines cluster and simple random sampling approaches in a two-stage sampling scheme"; the departments were randomly selected applying cluster sampling and then sample units which in this case are households were selected using simple random sampling approach within those departments. As the population is homogenous, the households finally selected for sampling are representative of entire population.

Departments were considered as the Primary Sampling Units (PSU), largely because they cover the target population completely and have a clearly identifiable boundary which is stable over time. Guatemala consists of 22 Departments in all. Applying cluster sampling, the number of departments that were required to be sampled was calculated as 12. Together these 12 departments constitute almost 80% of the population of Guatemala. Further, the number of households that were required to be sampled from these Departments was derived as 500. These 500 households were then randomly selected from the above-mentioned departments.

The result of the survey showed that average consumption of firewood in the surveyed households was 22.06 kg/day. Average consumption in summer season (21.49 Kg/day) varied a little from average consumption in winter season (22.63 Kg/day). During both seasons, maximum households consumed between 20 to 25 kilograms of firewood per day.



The baseline survey report is being submitted with this PoA DD.

Determination of the share of non-renewable biomass (f_{NRB})

The determination of the share of non-renewable biomass (f_{NRB}) in the project area is based on calculations provided in spreadsheet and report by C4 EcoSolutions (Pvt.) Ltd which has been calculated in accordance with Tool 30.

Parameters used for calculation of f_{NRB}

HW_{region} - Average household wood fuel consumption, including fuelwood and charcoal in the country/region.

The household fuelwood and charcoal consumption values have been extrapolated to 2018 using a second-order polynomial (quadratic) regression in R. Household wood fuel and charcoal consumption values over a period of 17/18 years that is from 2000 to 2016 (charcoal) and 2000-2017 (wood fuel) was used to calculate the 2018 consumption value. In line with the requirement of Data/Parameter Table 1, Tool 30; the data has been sourced from Energy statistics database – United Nations Statistics Division[20]

TI_{region} - Non-domestic woody biomass including fuelwood and charcoal consumption for energy applications in the country/region

Non-domestic fuelwood and charcoal consumption values have been extrapolated to 2018 using a second-order polynomial (quadratic) regression in R. Commercial wood fuel and charcoal consumption values over a period of 10/11 years that is from 2007 to 2016 (charcoal) and 2007-2017 (wood fuel) was used to calculate the 2018 consumption value. In line with the

[20] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW

requirement of Data/Parameter Table 2, Tool 30; the data has been sourced from Energy statistics database – United Nations Statistics Division[21].

MAI_{forest},& MAI_{other} - Mean Annual Increment of woody biomass growth per hectare of forest and other wooded land areas.

As required by Data/Parameter Table 4, Tool 30; this value has been sourced using option (b)- 2006 IPCC Guidelines for National Greenhouse Gas Inventories for "Above-ground biomass growth rates (t/ha-yr) for different ecological zones" (Chapter 4, Table 4.9). Use a weighted average based on the forest area of two different age categories (i.e. above and below 20 years)

F_{forest},& F_{other} -Extent of forest as well as other wooded land

In the study done by C4 EcoSolutions (Pvt.) Ltd, the forest and other wooded land cover for Year 2000 and 2018 was estimated using Hansen/UMD/Google/USGS/NASA spatial data, and disaggregated according to the FAO global ecological zones. The tree cover was estimated as the fractional area of each grid cell that is covered by the tree canopy (as the size of the grid cells are considerably larger than any individual tree). The total area of all the grid cells that contain some tree cover is roughly equivalent to the total area of the ecological zone. While FAO definitions consider all areas with >10% cover forests, areas with 5-10% cover other wooded lands, and <5% cover as other lands, in the present report in order to capture the forest dynamics and how they may be changing (due to loss or gain in tree cover), the calculations have given some consideration to the forest cover thereby accounting for any deforestation or degradation that results in a transition across the relevant thresholds (5% or 10%). In line with the requirements of Data/Parameter Table 5, Tool 30, option (b) official data has been used for determining this parameter.

P_{forest},& P_{other} -Extent of non-accessible area within forest and other wooded land areas.

According to tool 30, P_{forest} and P_{other} includes "Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest/other wooded land areas. To define "geographically remote area", the Tool clarifies that DNAs/PPs may consider proximity to roads or rivers. For example, forests/other wooded lands that are beyond the average distance travelled to collect firewood can be considered non-accessible. The information of the average travel distance may be sourced from national studies or peer-reviewed literature, or surveys in the project area.

Woody biomass density increases significantly as a function of distance from the edge of a settled area. The Global Alliance for Clean Cookstoves found that in urban areas women spend an average of 1.4 hours and men an average of 2.2 hours collecting fuelwood. This average was higher for women in rural areas, 1.8 hours, and lower for men, 2.1 hours[22]. Assuming that the harvesting of fuelwood takes at least half of the time spent, and an average walking speed of 4 km/hr over uneven terrain, the average one-way walk distance to fuelwood source can be conservatively estimated to be less than 2.5 km. Forested areas beyond the harvestable distance of 2.5 km were therefore determined to be geographically remote. The total available

[21] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aCH

[22] Global Alliance for Clean Cookstoves. Guatemala Cookstoves and Fuel Market Assessment. 1–102 (2013).

woody cover was estimated by subtracting the woody cover of the protected areas and the woody cover of geographically remote areas from the total woody cover[23].

To calculate this accessible woody cover, all the areas that are within 2.5 km of a road, leaving protected area was masked out. The protected cover has similarly been determined by masking out all areas that don't fall within a protected area. In line with Option (b) of Data/Parameter Table 6; Tool 30; the extent of protected area has been sourced from National study that is Hansen/UMD/Google/USGS/NASA spatial data. Determination of 2.5 km as the average travelling distance for wood collection has been derived from literature review.

All estimations/ extrapolations/projections have been included in the f_{NRB} calculation spreadsheet, which is submitted along with this PD.

3.5 Additionality

The project was included as a CPA under CDM PoA with CDM reference 8480-P1-0001-CP1. There is no regulatory requirement to use ICS in Guatemala, therefore according to 3.8.9 of the VCS Standard (Version 4.1), this section does not need to be completed further.

3.6 Methodology Deviations

This project did not apply any methodology deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The improved cookstove is introduced as energy efficiency measure in the project, therefore equations 1 and 2 of the methodology will be applied to calculate the net GHG emission reductions.

$$ER_y = \sum_i \sum_j ER_{y,i,j}$$ Equation (1)

Where:

i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire

[23] More details have been included in the fNRB report being submitted along with this PoA DD

j	=	Indices for the situation where there is more than one batch of improved cookstove of type i
ER_y	=	Emission reductions during year y in t CO_2e
$ER_{y,i,j}$	=	Emission reductions by improved cookstove of type i and batch j during year y in t CO_2e

$$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times \left(EF_{wf,CO2} + EF_{wf,non\ CO2}\right) \times N_{y,i,j} \times 0.95 \quad \text{Equation (2)}$$

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})[24]
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)[25]
$EF_{wf,CO2}$	=	CO_2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO_2/TJ)[26]
$EF_{wf,non\ CO2}$	=	Non-CO_2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO_2/TJ)[27]
$N_{y,i,j}$	=	Number of improved cookstoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakage

To calculate $B_{y,savings}$, we use Option 1 of the applied methodology[28]

[24] Default values endorsed by designated national authorities and approved by the Board are available at https://cdm.unfccc.int/DNA/fNRB/index.html

[25] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction

[26] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

[27] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

[28] Equation 3 of methodology VMR 0006

$$B_{y,savings,i,j} = B_{old} \times \left(1 - \frac{\eta_{old}}{\eta_{new,i,j}}\right)$$

Where:

B_{old} Quantity of wood fuel used in the absence of the project activity in tonnes

η_{old} A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e., without a grate or a chimney.

$\eta_{new,l,j}$ Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

As some of the project households continue to use baseline cookstoves along with improved cookstoves, B_{old} has been adjusted ex-post based on the percentage of project households found to continue such practice according to the Equation 6 of applied methodology as follows:

$$B_{old,adjusted} = B_{old} \times (1 - \mu_y)$$

Where:

$B_{old,adjusted}$ = Adjusted B_{old} to account the ex-post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device)

μ_y = Baseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves.

For ex-ante estimates:

$B_{y,savings,i,j}$ = 8.05 x (1 – 0.10/0.3167)

= 5.5095

$ER_{y,i,j}$ = 5.5095 x 11,132 x 0.80 x 0.0156 x (112 + 26.23) x 0.95

= 100,287.00

= 100,287 (Rounded down value)

4.2 Project Emissions

The methodology does not account for project emissions separately, but instead quantifies net emission reductions achieved by the project.

4.3 Leakage

Leakage shall be considered as default 0.95 in accordance with methodology.

4.4 Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2021	100,287	-	-	100,287
2022	100,287	-	-	100,287
2023	100,287	-	-	100,287
2024	100,287	-	-	100,287
2025	100,287	-	-	100,287
2026	100,287	-	-	100,287
2027	100,287	-	-	100,287
2028	100,287	-	-	100,287
2029	100,287	-	-	100,287
2030	100,287	-	-	100,287
Total	1,002,870	-	-	1,002,870

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	Bold
Data unit	Tonnes/year

Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Baseline surveys, ex-ante
Value applied:	8.05
Justification of choice of data or description of measurement methods and procedures applied	The baseline survey assessed the average biomass usage per household per annum amongst users of traditional 3-stone fires or traditional pot support, according to interviews in Guatemala.
Purpose of the data	Calculation of baseline and project emissions
Comments	See CDM PoA-DD for more details on the baseline measurement

Data / Parameter	**L**
Data unit	Fraction
Description	Net to gross adjustment factor to account for leakage
Source of data	Paragraph 8.3 of the VMR 0006 methodology, version 1.1
Value applied:	0.95
Justification of choice of data or description of measurement methods and procedures applied	A net to gross adjustment factor (0.95 default) is applied in order to adjust B_{old} to account for leakages as per paragraph 8.3 of the VMR 0006, version 1.1 methodology.
Purpose of the data	Calculation of leakage
Comments	-

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of baseline stove
Source of data	Paragraph 9.2, of the VMR 0006 methodology, version 1.1, default
Value applied:	0.10 (default for conventional open fires, as stated in the methodology)
Justification of choice of data or description of measurement methods and procedures applied	Provided as default value since replaced system is conventional open fire.
Purpose of the data	Calculation of baseline and project emissions
Comments	-

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of non-renewable biomass saved by the project activity
Source of data	FAO, ex-ante, calculated
Value applied:	0.7982
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante. C4 EcoSolutions (Pty) Ltd was appointed as third party to study and derive the f_{NRB} value for Guatemala.
Purpose of the data	Calculation of baseline and project emissions
Comments	The report of f_{NRB} will be made available to VVB during the validation

Data / Parameter	$NCV_{biomass}$
Data unit	TJ/t
Description	Net calorific value of non-renewable biomass that is substituted
Source of data	IPCC default value for fuel wood, ex-ante, VMR 0006 methodology, version 1.1.
Value applied:	0.0156 TJ/tonne
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in VMR 0006, version 1.1
Purpose of the data	Calculation of baseline and project emissions
Comments	-

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO_2/TJ
Description	CO2 emission factor for the use of wood fuel in baseline scenario
Source of data	IPCC default value, ex-ante, VMR 0006 methodology, version 1.1.
Value applied:	112 tCO_2/TJ
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in VMR 0006, version 1.1
Purpose of the data	Calculation of baseline and project emissions
Comments	-

Data / Parameter	$EF_{wf,non\ CO2}$
Data unit	tCO_2/TJ
Description	Non-CO_2 emission factor for the use of wood fuel in baseline scenario
Source of data	IPCC default value, ex-ante, VMR 0006 methodology, version 1.1.
Value applied:	26.23 tCO_2/TJ
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in VMR 0006, version 1.1
Purpose of the data	Calculation of baseline and project emissions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Quantity
Description	Number of ONIL Stoves in operation during the monitoring period as determined by the monitoring survey. This includes total number of stoves distributed/installed in the entire CPA.
Source of data	ONIL Stove registration data and data from monitoring surveys
Description of measurement methods and procedures applied	The percentage of stoves found to be still in operation based on the sampling plan in this monitoring period is applied to the total number of stoves distributed/installed in each CPA included in the sample (according to the ICS registration records in the monitoring database and the applicable sample frame). The proportion of sampled ICS found in operation in this monitoring period was applied to the total number of stoves for each CPA when calculating emission reductions.
Frequency of monitoring/recording	At least once every two years
Value applied:	11,132
Monitoring equipment	Monitoring surveys and registration card records loaded into database
QA/QC procedures applied	Staff will be trained to obtain unbiased and reliable survey data. Monitoring database will be checked for errors. There were four cases in which the stoves were not considered in use despite

	users affirming using stoves: 1. When surveyors discovered, based on visual inspections or their observations that a stove was not in use. 2. When users had another type of improved cookstove along with the ONIL stove. The measure was taken to prevent double counting with other programs and to accurately estimate emissions reductions (as the presence of another improved cookstove may affect the baseline). 3. In cases where there was no prior use of three stone fires. In these cases, the firewood baseline would not be applicable. 4. When stoves were modified to operate as three stone fires (e.g., when insulating material and combustion chamber were removed).
Purpose of data	Calculation of baseline and project emissions
Calculation method	11,132 = 1.00 multiplied by 11,132 stoves eligible in the database. Note: For ex-ante calculation, the percentage of ONIL stove found in operation is assumed to be 100%.
Comments	-.

Data / Parameter	$t_{y,j}$
Data unit	Fraction
Description	Fraction of project's monitoring period the stove is in operation (weeks in operation/total weeks in monitoring period)
Source of data	ONIL Stove registration data in monitoring database and length of monitoring period
Description of measurement methods and procedures applied	Calculated from database records
Frequency of monitoring/recording	Calculated value
Value applied:	1.00 [average]
Monitoring equipment	--
QA/QC procedures applied	Cross checks and spot checks in the database to ensure installation/registration dates are correctly captured
Purpose of data	Calculation of baseline and project emissions
Calculation method	Days in operation during monitoring period divided by total number of days in monitoring period. This calculation is applied to every ONIL stove in the database.
Comments	-

Data / Parameter	$\eta_{new,i,j}$

Data unit	Fraction
Description	Efficiency of the ICS
Source of data	Efficiency tests conducted in monitoring period
Description of measurement methods and procedures applied	The Water Boiling Test (WBT) protocol will be used. The WBTs will be conducted by trained staff. Stoves will be tested at the place of installation (i.e., in stove user households) using firewood available in the same households. Each sampled stove will be tested once for the cold start phase and once for hot start phase.
Frequency of monitoring/recording	At least once every two years
Value applied:	31.67%
Monitoring equipment	• Digital scales • Firewood moisture meters • Digital thermometers
QA/QC procedures applied	The reliability calculation will be conducted to ensure that the result obtained from the survey meets the precision required.
Purpose of data	Calculation of project emissions
Calculation method	WBT protocol calculation methods.
Comments	-

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	Monitoring surveys.
Description of measurement methods and procedures applied	A survey asked for usage of baseline stoves as per the monitoring plan outlined in Section I.7.2 of the PoA-DD. μ_y was calculated in each monitoring period as follows: the number of sampled households with distributed ICS that also continue to use a baseline stove divided by the total number of surveyed samples.
Frequency of monitoring/recording	At least once every two years
Value applied:	0%
Monitoring equipment	Surveys
QA/QC procedures applied	Data for this parameter was collected using the same survey for the fraction of $n_{y,j}$ (appliances in operation) conducted by trained project staff members.
Purpose of data	Calculation of baseline and project emissions
Calculation method	The number of households with operational ONIL stoves and continuing to use baseline stoves divided by the total number of surveyed households.

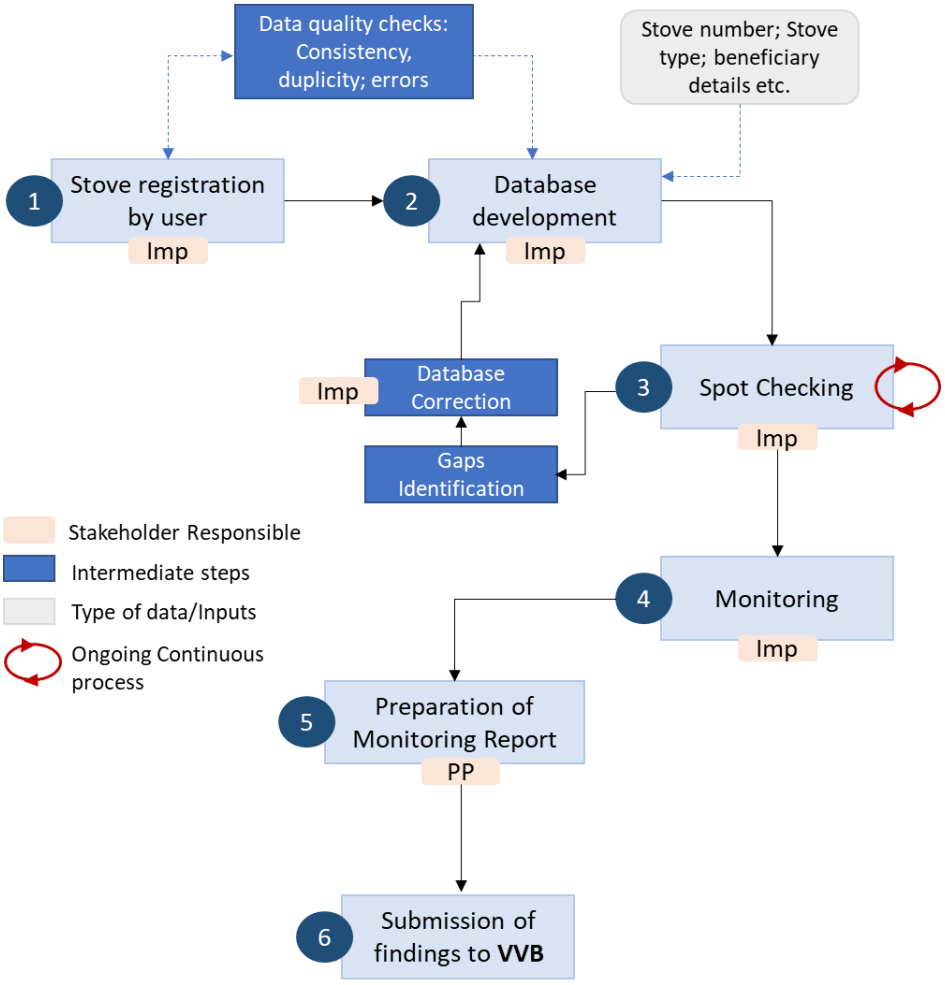
Comments	For ex-ante calculation, it is assumed that no pre-project device found in operation.

Data / Parameter	$B_{old\ adjusted}$
Data unit	Tonnes/year
Description	If baseline stoves continue to be used, adjustment ensures that fuel wood consumption of those stoves is excluded from B_{old}.
Source of data	Baseline survey, ex-ante; monitoring survey ex-post
Description of measurement methods and procedures applied	According to VMR0006 version 1.1, Where the project households continue to use baseline cookstoves along with improved cookstoves, B_{old} shall be adjusted ex-post based on the percentage of project households found to continue such practice. For such cases, the quantity of woody biomass saved due to implementation of improved cook stoves shall be calculated using an adjusted value to account for ex-post use of baseline stoves in addition to improved cookstove.
Frequency of monitoring/recording	Once per monitoring period
Value applied:	8.05
Monitoring equipment	-
QA/QC procedures applied	Data for this parameter was collected using the same survey for the fraction of µy conducted by trained project staff members.
Purpose of data	Calculation of baseline and project emissions
Calculation method	To be calculated using the formula below: $B_{old\_adjusted} = B_{old} \times (1 - \mu_y)$ $= 8.05 \times (1 - 0.0)$ $= 8.05$
Comments	-

5.3 Monitoring Plan

The project's monitoring system will follow the monitoring plan described in section I.7.2 of the registered PoA-DD under CDM.

Organizational structure, responsibilities and competencies: To obtain the monitoring variables, the project implementer will follow the steps, organizational structure and responsibilities in the flow chart below.



Below is the description of the above steps on the flow-chart.

The PP will coordinate, manage and assist HELPS international A.C. (Imp) and monitoring third parties with each element of the monitoring plan. Details of the monitoring steps on the flowchart are the following:

1. **HELPS international A.C.: User registered stove**. HELPS International A.C. field personnel will collect the information in the Registration Card from the users. Information will be collected via a Registration Card filled by HELPS International A.C. staff and partner organizations. HELPS International A.C. staff will double-check the accuracy of the information and requested clarifications if needed.
2. **HELPS international A.C.: Data logged into database**. HELPS International A.C.'s trained staff will input the information from the Registration Card into the database. HELPS International A.C. and CQC will check the database records and remove duplicates (this included completing the serial number, checking for name duplicates, etc...).
3. **HELPS international A.C.: Spot-checks (ongoing).** HELPS International will A.C. visit locations in the field and report updates to office either via telephone or forms. HELPS International A.C. personnel will correct the database and clearly mark stoves that were not installed, were given away, the end user died or left town, or had any other issues that made the stove

no longer eligible to participate in the CPA. These stoves will be excluded from the emission reduction calculations.

4. **Third Parties: Monitoring.** Third Parties will follow the sampling plan outlined in the PoA-DD (Section I.7.2).
5. **PP Preparation of monitoring report**. CQC will prepare the final monitoring report and retain copies of the document.

Data measuring, recording Method and Implementation of Sampling Approaches

Steps 1, 2 and 3 will capture end user information and populate the database, as well as provide database quality control.

Step 4 involves creating sampling surveys to capture data on continuous use of stove ($n_{y,j}$) and use of baseline systems along with ICS (μ_y) as well as stove thermal efficiency ($\eta_{new,i}$) as described in the table below.

Parameter	Description of Parameter	Sampling approach (outcome in brackets)
$n_{y,j}$	Proportion of ONIL Stoves still in operation	Visual inspection of the premises to see if ONIL stove is operational and in use. Interview with end user if required to verify that ONIL stove is still in use [Yes/No]
μ_y	Percentage of continued baseline stove use among ONIL stove households in the database	Interview with end user and visual inspection to determine if a baseline (replaced) stove is still being used in addition to ONIL stove [Yes/No]
$\eta_{new,i}$	Thermal Efficiency of operational ONIL Stoves	ONIL Stoves were tested using WBTs [ONIL stove thermal efficiency]

Sampling will capture the information on monitoring variables with required confidence/precision and will use simple random sampling (as per of EB 86 Annex 4). The method will involve the random selection of the ONIL stoves distributed by the Since all stoves are of the same model and will be managed by the same CPA Implementer, no further stratification will be needed to capture parameter $n_{y,i}$ and μ_y data. Stoves will be divided into the Primary Sampling Units for $\eta_{new,i}$ according to the year of installation of the stoves.

Step 5 involve monitoring analyses and accuracy and precision checks. The project implementer and PP scrutinize the monitoring data to confirm accuracy of results, analyze the data, and estimate the resulting emissions reductions outlined in this monitoring report.

The following parameters will be obtained though sampling:

1. $n_{y,i}$: proportion of stoves in operation
2. μ_y: fraction of households that continue to use baseline systems (3-stone fires) along with ONIL stoves
3. $\eta_{new,i}$: thermal efficiency of ONIL Stoves

simple random sampling will be used for all monitoring parameters in accordance with the Sampling Plan of section I.7.2 of the registered PoA-DD. The objective is to obtain reliable and unbiased estimates of the monitoring parameters. Reliability levels were set at 90% confidence and 10% precision as per VMR0006 version 1.1.

A single homogeneous population (Primary Sampling Unit) will be considered for $n_{y,i}$ and μ_y (proportion parameters) since the project Implementer and stove model (HELPS International A.C. and ONIL Stove respectively) are the same throughout the project.

Implementation and quality assurance and control and procedures used for handling any internal auditing performed and any non-conformities identified:

PP will train monitoring personnel on monitoring procedures, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. The monitoring survey will include several questions to support the information on the key monitoring parameters. These include visual inspections to confirm stove use and presence of baseline stoves, comments by surveyors, check of randomly selected households against actual household information, and refusal tracking. These strategies aimed at minimizing surveyor or non-response biases. The questionnaire will be piloted in the field prior to implementation.