

Gold standard for the global goals
Monitoring report



June 2017, version 1

GS 1247 Improved Kitchen Regimes

Title of the project	GS1247 VPA 164 EcoZoom Improved Stove Programme, Uganda (GS 7153)
Gold Standard project id	GS7153
Version number of the monitoring report	Version 3
Completion date of the monitoring report	08/01/2021
Date of project design certification	17/09/2020
Start date of crediting period	18/09/2018
Duration of this monitoring period	18/09/2018 to 30/09/2020
Duration of previous monitoring period	This is the first monitoring period
Project representative(s)	Erik Wurster, Hesbon Nyangena, Biolite
Host Country	Uganda
Certification pathway (activity certification/impact certification)	Impact Certification
SDG Contributions targeted (as per approved PDD)	1- SDG 3 (Good Health and Well Being) 2- SDG 7 (Affordable and Clean Energy) 3- SDG 13 (climate action)
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	GSVER
Selected methodology(ies)	Gold Standard Methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1
Estimated amount of certified SDG impact (as per approved PDD)	1- SDG 3 – 12,187 fewer bouts of coughing per day 2- SDG 7 – 6,954 tons/hh biomass saved 3- SDG 13 – 20,381 tons CO ₂ e saved
Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	1- SDG 3 – 17,275 fewer bouts of coughing per day 2- SDG 7 – 11,117 tons/hh biomass saved 3- SDG 13 – 20,327 tons CO ₂ e saved SDG 13 vintage Breakdown: 2018: 2,869 2019: 9,972 2020: 7,486 Total – 20,327 tons CO ₂ e

SECTION A. Description of project

A.1. Purpose and general description of project

>> (Provide a brief summary of the detailed description given in section B.1 including purpose of the project, brief description of the installed technology and equipment and relevant dates for the project (e.g. construction start/end, commissioning, continued operation periods, etc.)

The Micro-Scale Voluntary Project Activity 164 EcoZoom Improved Stove Programme, Uganda involves the distribution of fuel-efficient cook stoves to households throughout Uganda. The programme is implemented by Biolite in conjunction with CO2Balance UK Ltd., who is the CME of the PoA.

The efficient cook stoves are three different efficient charcoal stoves manufactured by EcoZoom. The EcoZoom stoves will be sold at attractive prices in exchange for the rights to the Voluntary Emission Reductions (VERs). The majority of families would not otherwise have access to the market for advanced fuel-efficient cook stoves for economic reasons.

According to the United Nations, between 1990 and 2005 Uganda has lost 26.3% of its forest cover and has a current deforestation rate of over 2% per year. While urban wood demand for construction and furniture plays a large role in this situation, the problem is also exacerbated by demand for charcoal, mostly in urban areas.

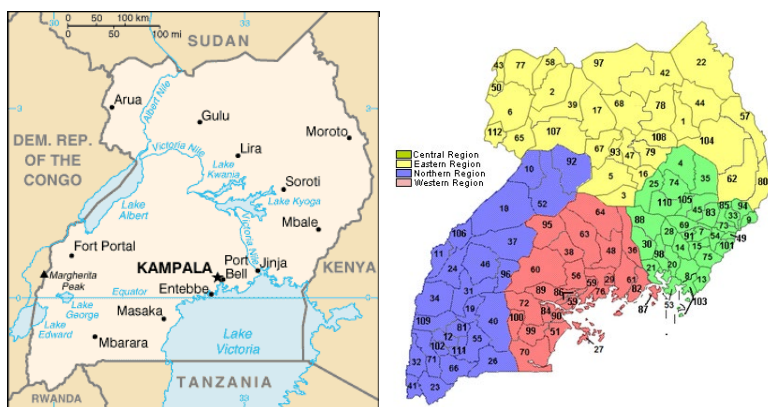
Around 95% of households in Uganda cook using traditional cookstoves that are inefficient and very polluting. Improved biomass cookstoves are built that reduce wood and or charcoal consumption and indoor air pollutants from incomplete combustion (CO and PM). This project will reduce greenhouse gas emissions by disseminating biomass stoves that have been proven through testing to be more efficient than traditional models

A.2. Location of project

>> (Provide host country, state/province, city/town details along with GPS co-ordinates.)

Republic of Uganda, nation-wide. The country is located on the East African plateau lying mostly between latitudes 04°12'N and 01°29'S and longitudes 29°34'E and 35°0'E.

All technologies included in the project activity will be implemented within such a boundary, which is formed by 4 administrative regions (Northern, Eastern, Central and Western).



According to the methodology, project proponents must define project boundary, target area, and fuel production and collection area.

- The project boundary is defined here as the geographic site where the project technologies are located. The end user contact information and location are recorded in the project database for as many stoves as possible that are distributed as part of the project activity, together with the unique stove serial number.
- The target area is defined by the political boundaries of the Republic of Uganda. The target area provides an outer limit to the project boundary in which the project has a target population.

- c. The fuel production and collection is the area within which the woody biomass can reasonably be expected to be produced, collected and supplied. Biomass consumed for cooking and charcoal production in Uganda is sourced throughout the countryside.

A.3. Reference of applied methodology

>> (Indicate title and version number of the methodology.)

Gold Standard Methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 1

A.4. Crediting period of project

>> (Provide start date and length of the crediting period as given in approved PDD.)

18/09/2018. The length of the crediting period is 7 years up to twice renewable

SECTION B. Implementation of project

B.1. Description of implemented project

>> (Provide information on the implementation status of the project during this monitoring period. Specify any deviations / delays compared to information in approved project.)

There were no deviations / delays in this project. A total of 3,186 stoves have been distributed as part of this project activity. To avoid double counting, we checked the Gold Standard and CDM registry for any projects that could have included these same types of stoves and there were no such projects in implementation and then we assigned a serial number to every single stove and we cross referenced all serial numbers between all the VPAs we have implemented and found no duplicates. Usage surveys, kitchen surveys and kitchen performance tests were carried out during this monitoring period. Surveys and testing were conducted in late 2019 and early 2020. Training of surveyors was conducted in the runup to the survey period, around September, 2019.

Monitoring Period Information:

1st Monitoring Period duration – 18/09/2018 to 30/09/2020

Total VERs during this first monitoring period – 20,327 tCO₂e

Vintage Break

18/09/2018 to 31/12/2018	2,869 tCO ₂
01/01/2019 to 31/12/2019	9,972 tCO ₂
01/01/2020 to 30/09/2020	7,486 tCO ₂

Technologies and/or measures

EcoZoom manufactures high efficiency charcoal stoves in China for import into Uganda. There are three models of stove involved in the project: the Jiko Fresh, Jiko Bora and Jiko Bora Mama Yao:

Jiko Fresh

The Jiko Fresh reduces toxic emissions, cooks faster than traditional stoves and saves significant quantities of charcoal compared to the baseline technology. The stove offers the following key characteristics:

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- 26cm diameter
- Combustion Chamber Volume: 1,155cm³
- Refractory metal combustion chamber
- Lightweight / high temperature thermal ceramic insulation
- Three-pronged universal cast iron stovetop
- Painted sheet metal with reinforced door
- Steel and silicone handles
- Door of metal with silicone grip on latch
- Non-slip rubber feet
- Thermal efficiency – 36.21%¹
- Expected useful life is up to 5 years



Jiko Bora

The Jiko Bora reduces toxic emissions, cooks faster than traditional stoves and saves even more charcoal than the Jiko Fresh compared to the baseline technology. The stove offers the following key characteristics:

- 28cm diameter
- Combustion Chamber Volume: 1,155cm³
- Refractory metal combustion chamber
- Lightweight / high temperature thermal ceramic insulation
- Three-pronged universal cast iron stovetop
- Painted sheet metal with reinforced door
- Steel and silicone handles
- Door of metal with silicone grip on latch
- Non-slip rubber feet
- Thermal efficiency – 37.74%²
- Expected useful life is up to 5 years



Jiko Bora Mama Yao

The Jiko Bora Mama Yao is the premium stove compared to the other two stoves. The stove offers the following key characteristics:

- 28cm diameter
- Combustion Chamber Volume: 1,866cm³
- Non-slip rubber feet
- Silicon and metal handles
- Three-pronged universal cast iron stovetop
- Refractory metal combustion chamber
- Painted sheet metal with reinforced door
- Thermal efficiency – 40.4%³
- Expected useful life is up to 5 years



¹ University of Nairobi, 2015

² University of Nairobi, 2015

³ KENYA INDUSTRIAL RESEARCH AND DEVELOPMENT INSTITUTE (KIRDI), NAIROBI, KENYA, DECEMBER 2017

B.2. Post-registration changes

There were no Post-registration changes within this project

B.2.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

>> (Indicate whether any temporary deviations have been applied during this monitoring period. If applied, provide a description of the deviation(s). Include the reasons for the deviation(s), how it deviates from the monitoring plan, applied methodology(ies) and/or applied approaches, the duration for which the deviation(s) is(are) applicable and justification on the conservativeness of the approach. Also indicate if prior approval from GS-TAC have been sought on the deviation.)

There were no deviations

B.2.2. Corrections

>> (Indicate whether any corrections to project information or parameters fixed at validation have been applied.)

There were no corrections

B.2.3. Changes to start date of crediting period

>> (Indicate whether any changes to the start date of the crediting period have been approved by Gold Standard that is relevant for this monitoring period.)

No changes to start date

B.2.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>> (Indicate whether any permanent changes from the approved monitoring plan, applied methodologies or applied approaches have been approved by GS-TAC that is relevant for this monitoring period.)

There were no permanent changes.

B.2.5. Changes to project design of approved project

>> (Indicate whether any changes to the design of the project have been approved by GS-TAC that is relevant for this monitoring period.)

None

SECTION C. Description of monitoring system applied by the project

>>

For further details and the full Monitoring Plan, see the attached 'Monitoring Plan' and 'Sampling Plan' documents.

A. Installation Record

A comprehensive installation record will record the following information:

- Date of sale
- Model of the stove
- Quantity of stoves sold
- Name, address and telephone number of stove end users where possible

The installation record will be backed up electronically, with original documentation being stored in the BioLite office in Kenya.

B. Project Database

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The project database will be derived from the Total Sales Record, with project technologies differentiated by different project scenarios. The project proponent expects that any improvements to the current design will not involve significant changes in combustion technology or changes in thermal efficiency of $\pm 5\%$, and hence will not entail a new project scenario. Any such changes to the current design will however be recorded in the project database, and if significant changes do occur, these will be new project scenarios. The useful life of the stove technology is estimated to be more than 5 years. As stoves break and go out of use, they will be replaced with new sold stoves although they will not necessarily be sold to the same households. These new stoves will be sold and included in the VPA as the older stoves break and go out of use.

All data collected in relation to the project will be held in the local office and/or on the Project Database for the entire life cycle of the project and a period of 2 years afterwards. The data may be archived during the project in order to maintain clarity and security. A total of 3,186 stoves were sold since the project started. This number of stoves is larger than the Ex-Ante calculations because the Ex-ante calculations included the Jiko Bora Mama Yao and this VPA included primarily smaller stoves and so an adjustment factor was applied.

C. Ongoing Monitoring Studies

The following ongoing monitoring studies are conducted for each project scenario following verification of the associated initial project studies. All VPAs with identical scenarios will be monitored as a group, with results of studies applied to each VPA.

a. Monitoring Survey- Completed annually, in time for the first verification

The monitoring survey investigates changes over time in a project scenario by surveying end users with project technologies on an annual basis.

b. Usage Survey- Completed annually, on time for any request of issuance

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 installation record.

c. Project KPT (FT) Update- Completed at least every other year

The FT Update will provide a fuel consumption assessment representative of the project technologies currently in use. As the stove remains materially the same each year, an Age Test may be chosen to be applied instead of a PFT. The PFT was completed on the Mama Yao project stove. An adjustment factor based on combustion chamber volume ratios was applied of fuel savings as per the carbon calculator Assumptions tab, cell N28.

d. Leakage Assessment- Completed every other year

The potential sources of leakage will be investigated. If the assessment quantifies an increase in fuel consumption by the non-project households attributable to the project activity, then calculations will be adjusted to account for this.

A number of questions were asked in the kitchen survey to determine whether leakage was a concern. Specifically, the following areas of leakage were investigated, and determined not to be a factor in total fuel savings:

- 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.

In most cases the traditional stoves replaced were found to be unimproved charcoal stoves (66%), with 34% being 3 stone fire; the latter have no market value. There is nothing limiting the use of three stone cooking across the country (technology is lowest, price is zero), which is why this cooking method is so widespread. This leakage source was therefore discounted for these. In terms of the unimproved charcoal stoves, extensive educational and marketing campaigns to discourage the use of inefficient stoves were conducted as they had proven helpful in the past.

- b) The non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.

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There is no evidence to suggest significant (if any) use of renewable energy for cooking in the project region as found in the kitchen surveys. As solar ovens are not available, renewable energy use for cooking would likely be use of animal dung or crop residues which will be used due to ease of availability/proximity to the home rather than due to a shortage of wood fuel, therefore being an independent factor. This leakage source was therefore discounted.

- 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 project boundary covered in this project overlaps with other CDM and VER project activities. A mechanism is in place to distinguish the biomass saved for each individual stove by uniquely identifying each stove with a serial number to ensure none of the project stoves are counted within another CDM or VER project activities as described in the monitoring plan. Kitchen surveys revealed this system to be working as intended.

- 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.

This is possible in some areas covered by the project, any compensation will however be covered in the results of the monitoring KPT (which encompasses all wood-fuel use) and the monitoring KS (which will pick up on any use of other fuels for space heating) and so this need not be separately assessed.

The climate throughout Uganda is temperate to hot. There is very little if any space heating by stoves throughout the country. No evidence was found that the project will result in increased fuel use for heating from inefficient stoves.

- e) By virtue of promotion and marketing of 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.

The kitchen survey revealed that all households were previously using less efficient technology than the project stove, thus this was not found to be a source of leakage.

e. Non-renewable Biomass Assessment Update- Reassessed at renewal of crediting period

In accordance with the methodology, the NRB assessment will remain fixed for the entire crediting period, although the project proponent may choose to re-examine the assessment at any time.

f. Abandoning inefficient baseline technology– completed every other year.

The extent to which users are being educated on the health and environmental benefits of abandoning inefficient baseline technology will be investigated every other year to ensure that sufficient effort is being made to abandon dangerous and inefficient cooking methods.

SECTION D. Data and parameters

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

(Copy this table for each piece of data and parameter)

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	fNRB,i,y
Unit	Fraction
Description	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
Source of data	UNFCCC Standardized Baseline ASB0002-2017 Fuel switch, technology switch and/or methane destruction in the charcoal sector of Uganda, valid to 31/10/2020
Value(s) applied)	0.88
Choice of data or measurement methods and procedures	The NRB is assessed in accordance with one of the approaches given in the methodology; here the default country specific fraction available on the CDM website is used.

Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period, although the project proponent may choose to re-examine the assessment at any time

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	NCV _p
Unit	TJ/ton
Description	Net calorific value of the project fuel
Source of data	IPCC default value for charcoal
Value(s) applied)	0.0295
Choice of data or measurement methods and procedures	IPCC default values are deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	NCV _p
Unit	TJ/ton
Description	Net calorific value of the project fuel
Source of data	IPCC default value for wood
Value(s) applied)	0.015
Choice of data or measurement methods and procedures	IPCC default values are deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	NCV _s
Unit	TJ/ton
Description	Net calorific value of fuel that is substituted or reduced
Source of data	IPCC default value for wood
Value(s) applied)	0.015
Choice of data or measurement methods and procedures	IPCC default values are deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	NCV _s
Unit	TJ/ton
Description	Net calorific value of the fuel that is substituted or reduced
Source of data	IPCC default value for charcoal
Value(s) applied)	0.0295
Choice of data or measurement methods and procedures	IPCC default values are deemed valid by methodology

Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	EF _{b,CO2}
Unit	tCO ₂ /TJ
Description	CO ₂ emission factor of the fuel that is substituted or reduced
Source of data	IPCC default value for wood
Value(s) applied)	112
Choice of data or measurement methods and procedures	Deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	EF _{b,CO2}
Unit	tCO ₂ /TJ
Description	CO ₂ emission factor of the fuel that is substituted or reduced
Source of data	IPCC default value for charcoal
Value(s) applied)	112
Choice of data or measurement methods and procedures	Deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire VPA crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	EF _{b,NON-CO2}
Unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor arising from use of wood fuel in baseline scenario
Source of data	IPCC default value for wood
Value(s) applied)	8.692
Choice of data or measurement methods and procedures	Deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter	EF _{b,NON-CO2}
Unit	tCO ₂ /TJ

Description	Non-CO ₂ emission factor arising from use of charcoal fuel in baseline scenario				
Source of data	IPCC default value for charcoal.				
			EF (kg GHG/TJ)	GWP	EF
					(kgCO ₂ e/TJ)
	Charcoal	CH ₄	330.5= (275+386)/2	25	8,263
	Charcoal	N ₂ O	5.45= (1.6+9.3)/2	298	1,624
			2006 IPCC	IPCC	Calculated from
Source	-	Guidelines for National Greenhouse Gas Inventories Volume 2, Table 2.9	Fourth Assessment Report	EF * GWP	
Value(s) applied	9.887= 8.263 + 1.624				
Choice of data or Measurement methods and procedures	-				
Purpose of data	Calculation of ERs				
Additional comment	Fixed for the entire VPA crediting period				

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	EF _{p, NON-CO2}
Unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor of the project fuel
Source of data	IPCC default value for wood
Value(s) applied)	8.692
Choice of data or measurement methods and procedures	Deemed valid by methodology
Purpose of data	Calculation of ERs
Additional comments	Fixed for the entire crediting period

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)				
Data/parameter	EF _{p,NON-CO2}				
Unit	tCO2/TJ				
Description	Non-CO2 emission factor arising from use of Project fuel				
Source of data	IPCC default value for charcoal.				
			EF (kg GHG/TJ)	GWP	EF (kgCO ₂ e/TJ)
	Charcoal	CH ₄	330.5= (275+386)/2	25	8,263
	Charcoal	N ₂ O	5.45= (1.6+9.3)/2	298	1,624
	Source	-	2006 IPCC	IPCC	Calculated from
			Guidelines for National Greenhouse Gas Inventories Volume 2, Table 2.9	Fourth Assessment Report	EF * GWP
	Value(s) applied	9.887= 8.263 + 1.624			
Choice of data or Measurement methods and procedures	-				
Purpose of data	Calculation of ERs				
Additional comment	Fixed for the entire VPA crediting period				

Relevant SDG Indicator	SDG 13 (climate action), Indicator 13.a: Total project emissions reductions (ER Calcs) SDG 7 (Affordable and Clean Energy), Indicator 7.1: Number of improved cookstoves distributed (sales record), Reduction in Fuel Use (KPT)
Data / Parameter	Pb,y
Unit	ton/HH-day
Description	Quantity of charcoal fuel that is consumed in baseline scenario b during year y
Source of data	Carbon Baseline and Project Survey Report for EcoZoom Cookstoves in Uganda, BioLite, July 2020
Value(s) applied	0.00843
Choice of data or Measurement methods and procedures	Kitchen performance test
Purpose of data	Measurement of baseline fuel consumption
Additional comment	A single baseline fuel consumption parameter is weighted to be representative of baseline technologies being compared for project crediting.

Relevant SDG Indicator	SDG 13 (climate action), Indicator 13.a: Total project emissions reductions (ER Calcs) SDG 7 (Affordable and Clean Energy), Indicator 7.1: Number of improved cookstoves distributed (sales record), Reduction in Fuel Use (KPT)
Data / Parameter	Pb,y
Unit	ton/HH-day

Description	Quantity of wood fuel that is consumed in baseline scenario b during year y
Source of data	Carbon Baseline and Project Survey Report for EcoZoom Cookstoves in Uganda, BioLite, July 2020
Value(s) applied	0.00015
Choice of data or Measurement methods and procedures	Kitchen performance test
Purpose of data	Measurement of baseline fuel consumption
Additional comment	A single baseline fuel consumption parameter is weighted to be representative of baseline technologies being compared for project crediting.

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter)

Relevant SDG Indicator	SDG 13 (climate action), Indicator 13.a: Total project emissions reductions (ER Calcs) SDG 7 (Affordable and Clean Energy), Indicator 7.1: Number of improved cookstoves distributed (sales record), Reduction in Fuel Use (KPT)
Data / Parameter	Pp,y
Unit	ton/HH-day
Description	Quantity of wood fuel that is consumed in project scenario p during year y
Measured/calculated/default	Measured
Source of data	Carbon Baseline and Project Survey Report for Ecozoom Cookstoves in Uganda, BioLite, October 2020
Value(s) of monitored parameter	0.0
Monitoring equipment	Kitchen performance test, FKB 16K0.2A Kern weighing scales, J-2000 Delmhost Moisture Meter
Measuring/reading/recording frequency:	Updated every two years, or more frequently
Calculation method (if applicable):	
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	Measurement of project fuel consumption
Additional comment	A single project fuel consumption parameter is weighted to be representative of project technologies of each age being credited in a given project scenario.

Relevant SDG Indicator	SDG 13 (climate action), Indicator 13.a: Total project emissions reductions (ER Calcs) SDG 7 (Affordable and Clean Energy), Indicator 7.1: Number of improved cookstoves distributed (sales record), Reduction in Fuel Use (KPT)
Data / Parameter	Pp,y
Unit	ton/HH-y
Description	Quantity of charcoal fuel that is consumed in project scenario p during year y
Measured/calculated/default	Measured
Source of data	Carbon Baseline and Project Survey Report for Ecozoom Cookstoves in Uganda, BioLite, October 2020
Value(s) of monitored parameter	0.00374
Monitoring equipment	Kitchen performance test, FKB 16K0.2A Kern weighing scales, J-2000 Delmhost Moisture Meter
Measuring/reading/recording frequency:	Updated every two years, or more frequently
Calculation method (if applicable):	
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	Measurement of project fuel consumption
Additional comment	A single project fuel consumption parameter is weighted to be representative of project technologies of each age being credited in a given project scenario

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	$U_{p,y}$
Unit	Fraction
Description	Usage rate in project scenario p during year y
Measured/calculated/default	Measured
Source of data	Carbon Baseline and Project Survey Report for Ecozoom Cookstoves in Uganda, BioLite, October 2020
Value(s) of monitored parameter	0.9
Monitoring equipment	Survey
Measuring/reading/recording frequency:	Annual or more frequently, in all cases on time for any request for issuance
Calculation method (if applicable):	Usage survey in line with latest usage guidelines as stated on the Requirements and Guidelines for carrying out usage surveys for projects implementing improved cooking devices dated 23/08/2017. Specifically, the project will comply with Level A, mandatory requirements as well as Level B, good practice requirements
QA/QC procedures:	Transparent data analysis and reporting.
Purpose of data:	Calculation of ERs
Additional comments:	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.

Relevant SDG Indicator	SDG 13 (climate action), Indicator 13.a: Total project emissions reductions (ER Calcs) SDG 7 (Affordable and Clean Energy), Indicator 7.1: Number of improved cookstoves distributed (sales record), Reduction in Fuel Use (KPT)
Data/parameter:	$N_{p,y}$
Unit	Project technologies credited (units)
Description	Technologies in the project database for project scenario p through year y
Measured/calculated/default	Measured
Source of data	Total sales record
Value(s) of monitored parameter	3,186
Monitoring equipment	Excel database
Measuring/reading/recording frequency:	Continuous
Calculation method (if applicable):	Sampling
QA/QC procedures:	Transparent data analysis and reporting.
Purpose of data:	Calculation of ERs
Additional comments:	The total sales record is divided based on project scenario to create the project database

Relevant SDG Indicator	SDG 13 (climate action) Indicator 13.a: Total project emissions reductions (ER Calcs)
Data/parameter:	$LE_{p,y}$
Unit	t_CO2e per year
Description	Leakage in project scenario p during year y
Measured/calculated/default	Measured
Source of data	Carbon Baseline and Project Survey Report for Ecozoom Cookstoves in Uganda, BioLite, October 2020
Value(s) of monitored parameter	0

Monitoring equipment	Kitchen survey and analysis
Measuring/reading/recording frequency:	Every two years
Calculation method (if applicable):	Sampling
QA/QC procedures:	Transparent data analysis and reporting.
Purpose of data:	Calculation of ERs
Additional comments:	Aggregate leakage can be assessed for multiple project scenarios, if appropriate

Relevant SDG Indicator	SDG 3 (Good Health and Well Being) Indicator 3.9: Reduced incidence of smoke related illnesses (Kitchen survey)
Data/parameter:	$S_{p,y}$
Unit	Bouts per day
Description	Number of coughing bouts per day in scenario p during year y, as self-reported by the user
Measured/calculated/default	Measured
Source of data	Carbon Baseline and Project Survey Report for Ecozoom Cookstoves in Uganda, BioLite, October 2020
Value(s) of monitored parameter	0
Monitoring equipment	Kitchen survey and analysis
Measuring/reading/recording frequency:	Every year
Calculation method (if applicable):	Kitchen Survey and Analysis
QA/QC procedures:	Transparent data analysis and reporting.
Purpose of data:	Calculation of ERs
Additional comments:	

Relevant SDG Indicator	SDG 3 (Good Health and Well Being) Indicator 3.9: Reduced incidence of smoke related illnesses (Kitchen survey)
Data/parameter:	$S_{b,y}$
Unit	Bouts per day
Description	Number of coughing bouts per day in scenario b during year y, as self-reported by the user
Measured/calculated/default	Measured
Source of data	Carbon Baseline and Project Survey Report for Ecozoom Cookstoves in Uganda, BioLite, October 2020
Value(s) of monitored parameter	2.66
Monitoring equipment	Kitchen survey and analysis
Measuring/reading/recording frequency:	Every year
Calculation method (if applicable):	Kitchen Survey and Analysis
QA/QC procedures:	Transparent data analysis and reporting.
Purpose of data:	Calculation of ERs
Additional comments:	

D.3. Implementation of sampling plan

>> (If data and parameters monitored described in section D.2 above are determined by a sampling approach, provide a description on how project participants implemented the sampling plan and surveys for those data and parameters according to the approved PDD.)

Between November, 2019 and October, 2020, BioLite conducted surveys to determine the effect of the project stoves on fuel consumption in households. In multiple locations throughout Uganda, households were surveyed to understand the stoves' usage patterns and fuel consumption among BioLite's target population. A kitchen performance test was also conducted in order to quantify fuel savings. The results are presented here in this final report.

Kitchen survey (aka monitoring survey)

BioLite's field team in Uganda administered a total of 105 surveys. The kitchen survey revealed a number of aspects of the demographic and socioeconomic nature of the project population. Of the total, 63% of surveys were conducted in person (66 interviews), while 47% of surveys were conducted via phone interview (39 interviews). It could be concluded based on this that the project has only one scenario, as defined by the methodology. It was also concluded that leakage affects and seasonal variation were found to be negligible.

Kitchen Performance Test

The kitchen performance test (KPT), referred to in the Gold Standard methodology as the Project Fuel Test (PFT) and Baseline Fuel Test (BFT), was performed in 23 households (HHs) between December 2019 and February 2020.

Each of the KPTs – the baseline and project scenarios were conducted over three full days, requiring daily household visits for four days. All household fuels were weighed daily using hand held weighing scales (Model: FKB 16K0.2A; Manufacturer: Kern). Wood and Charcoal fuel moisture was measured daily in each of the household using a moisture meter. A KPT survey was also administered daily to record information about the cooking stove and fuel usage, the number of meals prepared, and the number of people cooked for. The average charcoal moisture content observed was of approximately 5.6%, and the average wood moisture content was 17%, both of these values are within a normal range for dry fuel and would not impact total heat output of the fuel when burned, particularly since the measurements were taken during the wet season.

Usage survey

A cross VPA sampling was conducted that covered 130 surveys. The 130 stoves were purchased by customers at least 6 months (0.5 years) prior to the start of the year for which they took part in the survey, as required by the methodology. All surveys were conducted in person and photos and GPS coordinates were recorded. The Usage survey was conducted following the requirements and guidelines for carrying out usage surveys for project implementing improved cooking devices dated 23/08/2017. In complying with Level A and B usage monitoring procedures, the following activities were conducted:

SECTION A

Step1: Defining Stove Use and Non-Use

This was guided by question 10 of the Usage survey sheet where the surveyor asked if the end user was using the project stove. Responses to this question set the basis for determining use or non-use of the project stove. In addition, surveyors also observed and recorded the status of the project stove during the survey visit. Responses to these observations were recorded under questions 13, 14 and 15 of the usage surveys sheets. These responses were used as secondary determining factors for use or non-use of the project stove.

Step2: Household Usage Survey

The usage survey had a nearly identical geographic breakdown as the kitchen survey. The usage survey covered 130 stoves that were purchased by customers at least the first 6 months (0.5 years) of the year for which they took part in the survey, as required by the methodology. All surveys were conducted in person. Photos of the kitchen and project stove were taken and recorded. GPS coordinates of the household location were also recorded. The surveys were conducted with the primary cook in the household which was guided by question 1, Section A of the usage survey sheet.

Step3: Verification Checks

Verification checks for this program are conducted by the Gold standard team for the microscale project cycle procedure.

SECTION B:

Field Team Training and Supervision:

All the surveyors in this project had previous surveying experience which was one of the requirements for getting hired to conduct the surveys. Furthermore, the surveyors underwent a virtual training with Biolite staff and their work was regularly reviewed by Biolite staff to ensure best practices were being used during data collection.

End User Training and Follow Up Visits:

It is procedural for Biolite to provide initial training to end users upon sale of a product. In addition, Biolite regularly follows up with end users to ensure customer satisfaction. Additional training is offered by Biolite to end users during warranty reviews.

Awareness Campaign:

This is embedded in Biolite's marketing programs. Biolite periodically conducts marketing campaigns and distributes marketing materials that communicate product benefits including continuous use of the project stove and how to keep in touch with Biolite.

Overall, 130 stoves were monitored. Usage surveys were conducted among 3-year-old, 2-year-old and 1 year old stoves. The results of the usage survey are as below:

Stove Vintage	Number of Samples	Number in Use	Number Not in use	Percentage in Use	Adjusted % in use	% Sold of Total	Weighted Average of Use
Year 3	30	30	0	100%	90.00%	56.20%	50.58%
Year 2	70	67	3	96%	90.00%	35.71%	32.13%
Year 1	30	30	0	100%	90.00%	8.09%	7.28%
Total	130	127	3				90.00%

Since the project complies with Level B usage monitoring procedures, the usage rate has been reduced to 90.0%.

SECTION E. Calculation of SDG outcomes

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

>> (Provide details of equations and approaches used to calculate/estimate baseline values.)

SDG 3 (Good Health and Well Being) - coughing bouts per day

$$S_b - S_p = S_{\text{reduction}}$$

$$2.66 - 0 = 2.66 \text{ bouts (per household, multiplied by } N_p)$$

SDG 7 (Affordable and Clean Energy) - According to third party sources 8% of Uganda's population relies on improved stoves (ADP 2012⁴). This was compared with the total number of stoves sold by this project (3,186). Further, total biomass saved was evaluated by multiplying fuel savings from kitchen performance test results ($P_{b,y} - P_{p,y}$) with the total number of stoves sold by the project (N_p).

$$P_{b,y} - P_{p,y} = P_{\text{savings}}$$

$$8.43 - 3.74 = 4.69 \text{ kg (per household, multiplied by } N_p)$$

⁴ ADP [Accenture Development Partnerships]. 2012. East Africa Regional Market Assessment. Washington, DC: Global

Alliance for Clean Cookstoves. Accessed 26 April 2019. <http://cleancookstoves.org/resources/182.html>.

SDG 13 (climate action)

Calculating Emission Reductions:

The methodology provides three choices for calculating emissions reductions:

Equation 1 was considered most appropriate as it requires an analysis of project and a baseline couple. This is the approach that is anticipated in time for the first issuance.

Equation 2 was considered unsuitable as this considered different fuels and/or emissions factors – the baseline and project fuels in this project are the same.

Equation 3 was considered unsuitable as it is relevant for cases of a single sample test. This equation is used, however, in calculating ex-ante emission reductions, but when ex-post emission reductions are calculated, equation 1 is used.

These equations, unless stated otherwise, were supplied in the methodology, the numbering reflects the order listed in the methodology. The key for the equations is explained in the table below in the “Calculating Ex-post Emission Reductions” section.

Baseline Emissions (ex-ante)

Baseline emissions are calculated using equation (3):

$$BE_{b,y} = B_{b,y} * ((fNRB_y * EF_{b,fuel,co2}) + EF_{b,fuel,nonco2}) * NCV_{b,fuel}$$

Where: $B_{b,y} = N_{b,y} * P_{b,y}$ (4)

$$BE_{b,y} = 109.12 * ((0.88 * 112) + 8.692) * 0.015 + 6132.36 * ((0.88 * 112) + 9.887) * 0.0295 = 19,794 \text{ tCo2e}$$

Project Emissions (ex-ante)

Project emissions are calculated using equation (5):

$$PE_{p,y} = B_{p,y} * ((fNRB_y * EF_{p,fuel,co2}) + EF_{p,fuel,nonco2}) * NCV_{p,fuel}$$

Where:

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

And:

$$P_{p,y} = \text{nold}/\text{nnew}$$

$$PE_{p,y} = 0 * ((0.88 * 112) + 8.692) * 0.015 + 3061.82 * ((0.88 * 112) + 9.887) * 0.0295 = 9,795 \text{ tCo2e}$$

Overall Emission Reductions

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

$$ER_y = 19,794 - 9795 - 0 = 9,999 \text{ tCo2e per year}$$

For an ex-ante estimate of emission reductions, fuel values obtained from the baseline and project fuel tests were used to get an accurate assessment of emission reductions. This process is fully described in the monitoring plan.

For full calculations please see accompanying ‘Ex-Ante Calculations Spreadsheet.’

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

>> (Provide details of equations and approaches used to calculate/estimate project values.)

Calculating Ex-post Emission Reductions:

Emissions reductions are verified and credited by comparing the emissions for a given project scenario to the emissions for the applicable baseline scenario. The initial emissions profile of each baseline and project scenario is determined by the results of the respective baseline and project studies. As the baseline fuel and project fuel are the same the overall GHG reductions achieved by the project activity in year y are calculated as follows:

$$ER_{y,y} = \sum b_{p,y} * N_{p,y} * U_{p,y} * P_{p,y} * NCV_{b,fuel} * (fNRB_y * EF_{b,fuel,co2} + EF_{b,fuel,nonco2}) - LE_{p,y}$$

Project Technology Days	$N(p,y)$
Cumulative Usage	$U(p,y)$
Specific fuel savings for individual technology	$P(p,b,y)$
Fraction of non-renewable biomass	f_{NRB}
Net calorific value of fuel reduced	$NCV(p, fuel)$
Emissions Factor CO2 for woodfuel	$EF(p, fuel, CO_2)$
Emissions Factor non CO2 for woodfuel	$EF(p, fuel, nonCO_2)$
Leakage for project scenario	$LE(p,y)$

E.3. Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG outcome

>>

SDG 3 (Good Health and Well Being) - coughing bouts per day

$S_b - S_p = S_{reduction}$

$2.66 - 0 = 2.66$ bouts (per household_day, multiplied by N_p)

$2.66 * 3,186 = 8,475$ coughing bouts per day

Monitoring period duration: 744 days

Net outcome for current Monitoring period = $8,475 \times 744 = 17,275$ coughing bouts

SDG 7 (Affordable and Clean Energy)

$P_{b,y} - P_{p,y} = P_{savings}$

$8.43 - 3.74 = 4.69$ kg/hh_day (per household, multiplied by $N_p * 365$)

$(4.69 / 1,000) * 365 * 3,186 = 5,454$ tons/hh-y

Monitoring period duration: 744 days

Net outcome for current Monitoring period = $5,454 \times 744 = 11,117$ tons

SDG 13

$ER_y = (\sum_b, p * N_{py} * U_{py} * P_{pby} * NCV_{b, fuel} * (f_{NRB_y} * EF_{b, fuel, CO_2} + EF_{b, fuel, nonCO_2}) - LE_{p,y}) * \text{Monitoring period (years)}$

$ER_y = (((3,186 * 0.9 * 0.0548 * 0.015 * (0.88 * 112 + 8.692)) + (3,186 * 0.9 * 1.0596 * 0.0295 * (0.88 * 112 + 9.887))) - 0) * (744 / 365) = 20,327 \text{ tCo}_2\text{e for the monitoring period}$

E.4. Summary of ex-post values of each SDG outcome for the current monitoring period

Item	Baseline estimate	Project estimate	Net benefit
SDG 3	17,275 Bouts per Day	0 Bouts per Day	17,275 Bouts per Day
SDG 7	19,982 Tons of biomass	8,865 Tons of biomass	11,117 Tons of biomass
SDG 13	39,173Tons of CO ₂ e	18,846Tons of CO ₂ e	20,327 Tons of CO ₂ e

E.5. Comparison of actual value of outcomes with estimates in approved PDD

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 3	12,187 Bouts per Day	17,275 Bouts per Day
SDG 7	6,954 Tons of biomass	11,117 Tons of biomass
SDG 13	20,381 Tons of CO ₂ e	20,327 Tons of CO ₂ e

E.6. Remarks on difference from estimated value in approved PDD

>> Slight differences in SDG 3 and SDG 7 were due to a slightly higher number of stoves included in the VPA compared to the exante figure, in order to reach the micro-scale cap of 10,000 VERs/yr. SDG 13 was virtually identical compared to exante figures.

SECTION F. Stakeholder inputs and legal disputes

There have been no grievances.

F.1. List all inputs/grievances which have been received for the project during the monitoring period together with their respective answers/actions

None.

>>

F.2. List all inputs/grievances from previous monitoring period where follow up action is to be verified in this monitoring period

None.

>>

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

None.