

TEMPLATE

KEY PROJECT INFORMATION & VPA DESIGN DOCUMENT (PDD)

PUBLICATION DATE **04.05.2022**

VERSION **v. 2.0**

RELATED SUPPORT - [Programme of Activity requirements](#)

This document contains the following Sections

Key Project Information

Section A – Description of project

Section B - Application of approved Gold Standard Methodology (ies) and/or demonstration of SDG Contributions

Section C – Duration and crediting period

Section D – Summary of Safeguarding Principles and Gender Sensitive Assessment

Section E – Summary of Local stakeholder consultation

Section F - Eligibility and inclusion criteria for VPAs inclusion

Appendix 1 – Safeguarding Principles Assessment (mandatory)

Appendix 2 - Contact information of VPA Implementer (mandatory)

Appendix 3- LUF Additional Information

Appendix 4 - Summary of Approved Design Changes (VPA specific)

KEY PROJECT INFORMATION

Type of VPA	☒ Real case VPA ☐ Regular VPA
Scale of VPA Note that a VPA can be of one scale. Please select applicable scale accordingly.	☐ Microscale ☐ Small scale ☒ Large scale
Title of corresponding real case VPA (if applicable)	GS 12063: HomeBiogas Programme in Kenya – VPA1
GS ID of real case VPA (if applicable)	GS 12064
GS ID of VPA	GS 12064
Title of VPA	GS 12063: HomeBiogas Programme in Kenya – VPA1
Time of First Submission Date	10/12/2022
Date of Design Certification	20/12/2023
Version number of the VPA-DD	05
Completion date of version	13/02/2024
Coordinating/managing entity	HomeBiogas Ltd
VPA Implementer (s)	HomeBiogas Ltd
Project Participants and any communities involved	HomeBiogas Ltd
Host Country (ies)	Kenya
GS ID and Title of applicable Design Certified VPA	NA
GS ID and Title of applicable Performance Certified VPA	NA
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities

	☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Other Requirements applied	Programme of Activity Requirement V.2.0
Methodology (ies) applied and version number	GS Methodology: Methodology for Animal Manure Management and Biogas Use for Thermal Energy Generation V.1.1
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A
VPA Cycle:	☒ Regular ☐ Retroactive

Table 1 – Estimated Sustainable Development Contributions

Sustainable Development Goals Targeted	SDG Impact (defined in Error! Reference source not found. Section B.6)	Estimated Annual Average	Units or Products
13: Climate Action (mandatory)	Amount of GHG Emission reduction	301,226	tCO2e/y
1: No Poverty	Proportion of population living in households with access to basic services	100%	
2: Zero Hunger	Number of farmers adopted practices promoted by the project	50,000	Nos
3: Good health and well being	Percentage of project population using polluting fuels	87.5% (reduction)	Nos.
5: Gender Equality	Average time saving associated with cooking time and fuel collection	3.55	Hrs.
7: Affordable and Clean energy	Number of beneficiaries: Households	50,000	Nos.
8: Decent work and economic growth	Total Number of Jobs	60	Nos
15: Life on Land	Total non-renewable wood fuel saved	108,739	Tonnes/year

SECTION A. DESCRIPTION OF PROJECT

Purpose and general description of project

The proposed project activity involves installation of biogas units (clean and sustainable source of renewable energy for cooking) at the target households in Kenya. HomeBiogas distributes 2.5 m³ biogas systems to rural households at subsidized price. The biogas system will replace traditional wood stove and thereby avoid CO₂ emission associated with wood burning. The biogas systems use the animal manure as feedstock which was dumped in a pit in the baseline scenario. Hence, the biogas systems also avoid CH₄ emission from the animal manure dumped in pits.

The project activity aims to provide around 50,000 households with a biogas unit. The capacity of the biodigester will be 8m³ (2.5 m³ gas tank volume). The gas production capacity and digester capacity are given below:

Type	Balloon type
Manufacture	HomeBiogas
Gas tank Volume	2.5 m ³
Digester Volume (excluding gas storage)	5.5 m ³
Total System Volume	8 m ³

The implementation of the biogas units has started on 1st February 2022. The biogas units are expected to start generating biogas for consumption, in about 20-25 days from its installation. The installation of the biogas units will be carried out progressively throughout the year. A project database will be maintained to keep a track of the date of installation and commissioning of each unit constructed. Each biogas unit constructed will be given a unique identification number so that they can be easily identified during the monitoring surveys and to avoid double counting of the total installed units.

Scenario prior to the implementation of the project activity:

In the context of the project activity a baseline survey was carried out of 225 rural households in the target project zones. The survey shows that the potential beneficiaries

in the project areas use mainly firewood for cooking in an inefficient traditional cook stove. The use of firewood along with the use of charcoal and LPG were also observed. The use of firewood for daily cooking is not only causing deforestation but also indoor air pollution affecting directly or indirectly the health of women and children. Every year, 3.8 million people worldwide die prematurely from illnesses related to indoor air pollution in homes, which results from the inefficient use of solid fuels (according to World health organization data) for cooking. The breakdown of these deaths by cause is as follows: 27% pneumonia; 18% strokes; 27% ischemic heart disease; 20% chronic obstructive pulmonary disease (COPD), and 8% lung cancer¹. The risk for women is higher due to more exposure to the indoor pollution while cooking.

The project is expected to be implanted on phase wise. Year wise implantation schedule is given below.

Year	Digesters implemented	Total Digesters in operation
Year 1	1,500	1,500
Year 2	13,500	15,000
Year 3	35,000	50,000

A.1.1. Eligibility of the VPA under approved PoA

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Table 2 Eligibility for VPA inclusion as per PoA requirements

No.	Eligibility Criterion	Description/ Required condition	Description of the VPA in relation to the criteria, Means of Verification and Supporting evidence
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¹<https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>

for inclusion		
1	Geographical boundaries of the VPA consistent with that of the PoA	The PoA boundary corresponds to the boundaries of Kenya. Each VPA will be located within Kenya. The project will be installed in Kenya. Hence, the VPA boundary is consistent with the geographical boundary set in the PoA Evidence: VPA-DD, section A.4 specifies location and boundary of the VPA.
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals, such as unique identifications of product and end user locations	A unique numbering system for devices (bio-digester) will be applied in each VPA, assigning a unique number to each device and allowing to clearly identify for each device to which VPA it belongs. Each biogas unit installed in the project will come with a unique id/number on it. The same id/number will be recorded in the CRM database. Also, location of each biogas system including latitude and longitude, End user address is recorded in the CRM database used by the CME. Thus, double counting shall be avoided. Also, all the end user address will be recorded and maintained in the CRM database of each VPA.
3	Conditions to check the start dates of VPA through documentary evidence	The construction start date of first digesters in the VPA shall be considered as start date of the respective VPA. As per project database, 01/02/2022 is the construction start date of the 1st digester mentioned in the project database. This is matching with start date mentioned in VPA-DD. Evidence: Project database has been updated with construction start date of all digesters.
4	Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents	The livestock population in the farm is managed fully or partly under confined conditions; The livestock are managed entirely in a confined conditioned. The cattle are kept in shed for 24 hours. Evidence: Baseline survey results.
		Manure or the streams obtained after treatment are not discharged into natural water resources (e.g., river or estuaries); Manure is not discharged in the natural water-bodies instead converted in to liquid bio-fertilizers and used for land application and the same will be monitored during ex-post.

		Evidence: The slurry application is included as monitoring plan in section B.7 of VPA-DD.
	The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	The annual average temperature in Kenya is 25°C degrees Celsius which is higher than 5°C.
	In the baseline scenario, the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m;	The average retention time of manure in pit/heap in the baseline condition is 3.34 months which is greater than one month and the depths are 1 m or more. Evidence: Baseline survey results.
	The baseline scenario should not involve methane recovery and destruction by flaring or combustion for gainful use.	There is no methane recovery in the baseline as the cattle dung is directly dumped in open pits.
		Evidence: Baseline survey results.
	The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project developer can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	The manure is available from the cattle shed which is near the house and the manure removal from the cattle shed and fed into digester on daily basis and hence there is no transportation and storage of feedstock involved Evidence: Baseline survey results.
	A technical measure to ensure that the gas holding capacity of the biodigester is sufficiently large to capture the biogas during periods of non-usage. A justification to demonstrate compliance with this requirement pertaining to the biogas digester size shall be included in the Project Design Documentation (PDD).	The biogas is used daily for the household cooking. There is no non-usage days involved. Hence this condition is not applicable.

	The activity is implemented by a project developer and can include additional project participants listed in Appendix 2 of the PDD template. The individual households may be represented collectively by community organizations, etc., but do not individually act as project participants	The CME is the project developer and no additional participants are involved. The contact details of CME is included in Appendix 2 of the PDD Evidence: Appendix 2 of PDD.
	The developer must design incentive mechanism(s), which should be effective as fast as possible, for the displacing the use of inefficient baseline stoves or cooking practices by the project cooking devices for daily usage and describe the incentive mechanism(s) in the PDD/VPA-DD at the time of validation.	The baseline technology (3 stones stove or mud stove for firewood use) in the project activity will be replaced by the use of biogas for daily cooking. The biogas gas is a clean cooking technology which results in reduction in some, reduction in cooking time, fuel wood collection time & utensils cleaning time. This itself act as encouraging factor to use biogas system. Additionally, to encourage the complete removal of old technology, the biodigesters are given to the beneficiary at subsidized cost. Also, to assure the continuous use of the biogas, beneficiaries will be trained in maintenance of the system. Also, CME will do annual survey to check the usage of old technology and deduct the same from the emission reduction.
	To avoid double counting or double claiming, the project developer must: a. clearly communicates its ownership rights and intention of claiming the emission reductions resulting from the project activity to the following parties by contract or clear written assertions in the transaction paperwork: all other project participants; project technology manufacturers;	a. A end-user agreement has been signed with the beneficiary explaining in local language the ownership rights of the emission reductions resulting from the project. Evidence: End user agreement

	and retailers of the project technology; and b. informs and notify the end users that they cannot claim emission reductions from the project, and c. excludes from the project activity, any biodigester and cookstoves that are included in any other voluntary market or CDM or Article 6 based mechanisms project activity/PoA and strive not to displace the cooking devices of another CDM or voluntary project/PoA. See data and parameters not monitored (section 3.11), Avoidance of double counting or double claiming with other mitigation actions (BGTA 2), for details on this demonstration.	b. The end users have been notified about the emission reduction rights during the stakeholder meeting Evidence: LSC report c. The VPA, nor any of its devices is not yet registered and not being registered as a standalone CDM project by ensuring that the VPAs has the full title over the emission reductions generated by the users listed in the VPA. Evidence: Declaration on double counting
5	Conditions to ensure that VPAs per the section 3.3 of meet the requirements for applied methodology, the demonstration of additionality following condition shall be fulfilled: The VPA with biodigester technology should confirm the VPA solely composed of isolated units where the users of the technology/measure are households or communities or institutions and where each unit results in ≤ 600 tonnes of emission reductions per year.² (Community services activity requirements V-1.2 –Annex B - Positive list para 1.1.3)	The biogas system are isolated units and the end users of the biogas system are households and each biodigester in the project will result in emission reduction of 9.05 tCO₂e which is less than 600 tCO₂e. Evidence: ER calculation sheet

² <https://globalgoals.goldstandard.org/201-ar-community-services-activity-requirements/>

		OR The additionality shall be proved as per most recent version of the UNFCCC additionality tools or any approved GS VER additionality tool.	
6	Describe the technologies/measures to be employed and/or implemented by the real case VPAs and its regular VPAs, including a description of their common features	VPAs under this PoA will consist in the distribution of bio-digester to users cooking/heating water with non-renewable biomass in the baseline scenario. The bio-digester will have a capacity of 2.5 m³ biogas generation per day.	The project involves distribution of bio-digesters to the users using the non-renewable biomass in the baseline. The biodigester to be distributed in the project activity will have capacity of 2.5 m³ biogas generation per day Evidence: The Section B.4 of VPA-DD confirms baseline scenario and section A.5 of the VPA DD specifics the type(s) bio-digester, capacity of digester including, among others, a description whether devices are fixed or portable and a specification of the capacity and approximated dimensions.
7	Specification of the technology/measure, such as the level and type of service, as well as performance specification based on, inter alia, testing/certification;	VPAs under this PoA will consist in the distribution of bio-digester to users cooking/heating water with non-renewable biomass in the baseline scenario. The bio-digester will have a capacity of 2.5 m³ biogas generation per day.	The project involves distribution of bio-digesters to users using the non-renewable biomass in the baseline. The biodigester to be distributed in the project activity will have capacity of 2.5 m³ biogas generation per day Evidence: The Section B.4 of VPA-DD confirms baseline scenario and section A.5 of the VPA DD specifics the type(s) bio-digester, capacity of digester including, among others, a description whether devices are fixed or portable and a specification of the capacity

			and approximated dimensions.
8	The PoA-specific requirements, including any conditions related to undertaking local stakeholder consultation and environmental impact analysis	The local stakeholder consultation is conducted at the PoA level (Section F of the PoA-DD). Each VPA will be implemented in similar social economic situations. The key stakeholders of the program both at PoA and VPA level are the same. An environmental impact analysis is not required (section E.2 of the PoA-DD).	The VPA is implemented in the rural households of Kenya which have similar social economic situation as described in the PoA-DD. Hence, the key stakeholders of this VPA and PoA-level are same. Evidence: Section E of VPA-DD Also, as per the PoA-DD the environmental analysis is not required for this VPA.
9	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance	The CME and the VPA operator (in case of being different from the CME) shall confirm that in case of public funding, there is no diversion of Official Development Assistance.	The project will be completely funded by HomeBiogas. No ODA fund is involved in the project. Evidence: ODA Declaration.
10	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/offgrid), and where applicable, distribution mechanisms (e.g. direct installation)	Target groups are domestic household who use traditional stoves for cooking and/or water heating with non-renewable biomass. The distribution mechanism is the direct distribution of devices (Bio-digester)	The target group of the VPA are the domestic households who use traditional stoves for cooking with non-renewable biomass Evidence: VPA-DD section A.1, describes the target groups. End user agreements template
11	If the generic VPA applies sampling for the determination of parameter values for calculating GHG emission reductions or net anthropogenic GHG removals, conditions related to sampling requirements for the PoA in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities"	No single sampling plan for all VPAs is proposed. If VPA-DD applies sampling for the determination of parameter values for calculating GHG emission reductions or net anthropogenic GHG removals then sampling plan will be provided in each VPA-DD in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities"	Since the project is GS VER project, the sampling plan is described in Section B.7.2 of the VPA-DD in accordance with the Applied GS methodology 'Methodology for animal manure management and Biogas use for thermal energy generation, version 1.1 and "Standard: Sampling and surveys for CDM project activities and programme of activities" Evidence:

VPA-DD, section B.7.2		
14	Awareness and agreement of those operating a VPA on PoA subscription	Where the VPA operator is different from CME, contractual provisions to ensure that those operating the VPA are aware and have agreed that their activity is being subscribed to the PoA. Evidence: VPA-DD, Section A.1
15	Monitoring plan	The monitoring plan of the VPA included under the PoA shall follow the requirements of applied methodology "Methodology for Animal Manure Management and Use of Biogas for Thermal Energy Generation" – V.1.1 & PoA-DD Evidence: Section B.7 of VPA-DD
16	Conditions to be met by each VPA regarding SDG outcomes assessment	The VPA shall confirm SDG contribution to minimum three SDGs out of targeted by the POA (ie, SDG 1, 2, 3, 5, 7, 8, 13 &15). SDG13 shall be considered as mandatory VPA confirms the contribution to SDG 1, 2, 3, 5, 7, 8, 13 & 15. This also includes the mandatory SDG 13. Evidence: Section B.6 of VPA-DD
17	Conditions to be met for retroactive VPAs	If a retroactive VPA is added to the PoA, the VPA documents shall be submitted to preliminary review within one year of its start date The project is a regular project. Moreover, the VPA documents are submitted to preliminary review on 10/01/2023 which is within one year from start date of VPA 01/02/2022. Evidence: Section C.1.1 of VPA-DD showing start date of the project.

Gold Standard General Eligibility criteria

As per the GS4GG Programme of Activity Requirements, v1.2, 'All Voluntary Project Activities (VPAs) or Component Project Activities (CPAs) submitted for Design Certification within a PoA, must be in compliance with relevant Gold Standard eligibility criteria (for example Principles & Requirements and applicable Activity Requirements)'.

The eligibility criteria as per GS4GG Principles & Requirements, v1.2 are explained below:

(a) Types of projects:

As per para 4.1.3, of GS4GG principles & Requirements v1.2, *"A Project type is automatically eligible for Gold Standard Certification if there are Gold Standard approved Activity Requirements and/or Impact Quantification Methodologies associated with it or it's reference in the Gold Standard Product Requirements. These are published to the Gold Standard website and shall be followed where provided for a given Project type"*

The VPAs under the PoA will include any of the following technologies:

i) Household biogas units (Waste Management)

Hence the project activities are automatically eligible under the project type categories as defined in the GS Activity requirements³:

(ii) Waste Management and handling (in case of bio-digesters)

The household biogas technology VPA-DD uses Gold Standard Methodology "Methodology for Animal Manure Management and Use of Biogas for Thermal Energy Generation – V.1.1"

Hence the project type is eligible under GS4GG.

(b) Location of Project:

The project will be installed in Kenya. This is eligible as per the GS4GG eligibility requirements which specify that the projects can be located in any part of world.

(C) Project area, Project Boundary & Scale:

³ Section 3.1.1, https://globalgoals.goldstandard.org/standards/201_V1.2_AR_Community-Services-Activity-Requirements.pdf

Project Area & Boundary:

The project boundary is the physical, geographical sites of:

- a. The livestock;
- b. Animal manure management systems;
- c. Biogas utilization for thermal applications;
- d. Digestate treatment, usage and/or disposal (where applicable).

The project shall also include physical, geographical sites of the project technologies/practices including the fuel collection and production area which is as per the gold standard methodology "Methodology for Animal Manure Management and Use of Biogas for Thermal Energy Generation – V1.1". The project boundary is defined in section B.3 i.e, The project boundary specifically includes bio-digesters, biogas stove, baseline manure management system and baseline fuel collection.

Project Scale:

- Total thermal energy output by the project is 82.5 MWth which is greater than the SSC limit for type I component (i.e. 45 MW thermal)
- The estimated total emission reduction from manure management is 278,338 tCO₂e (5.57 tCO₂/digester*50,000 digester) which is greater than the SSC limit for Type III component (ie, 60,000 tCO₂e.)

The calculation is provided in section A.6.

Hence, the project is a large scale VPA.

Double counting

The VPA is not included in any other voluntary or compliance standards programme unless approved by Gold Standard.

CME/VPA implementer will sign end user agreement with all beneficiaries to transfer the VER rights to CME/VPA implementer. Also, a unique ID number given to each digesters system that consist reference to the PoA & respective VPA. Hence, digesters under the VPA will not be counted under another carbon project or double counted among the different VPAs of this proposed PoA.

Hence, there will not be any double counting of carbon credits.

(d) Host Country Requirements:

No legal, environmental, ecological and social regulations in Kenya prevent implementation of biodigesters in the rural households. Hence, the VPA follows the Host Country's legal, environmental, ecological and social regulations.

(e) Contact Details

The contact details of the project participants are provided in Appendix II.

(f) Legal Ownership:

The project devices (Bio-digesters & biogas stove) will be provided by HomeBiogas at subsidized cost. Beneficiaries will be considered as legal owners of the project devices. However, the social benefits and VERs will be with HomeBiogas and HomeBiogas will sign a detailed End user agreement mentioning all the criteria with all the end-user beneficiaries before the commissioning of the project devices (Bio-digesters). In line with the FPIC requirement, end user agreement will be provided as a proof that end-users are aware of and willing to give up their rights on Products. The transfer of Product ownership has been discussed during local stakeholder consultations.

Through declaration, the equipment manufacturer/supplier confirmed that all the emission reduction rights are with CME.

(g) Other Rights:

Except the Social benefits and VERs, all other legal rights of the project devices including the use of biogas slurry (bio-fertilizers) are with the beneficiaries.

(h) ODA Declaration:

The VPA is 100% funded by HomeBiogas. Hence No ODA fund is involved. The CME has provided ODA declaration conforming the same.

Hence, the VPA satisfy all the Gold Standard General Eligibility criteria.

A.1.2. Legal ownership of products generated by the VPA and legal rights to alter use of resources required to service the project

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The legal ownership of the VERs regenerated from the VPA is HomeBiogas. All end users sign the end user agreement confirming the same.

Location of VPA

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The project will be implemented in rural households in Kenya.

The geographical boundary of Kenya is given below:

Latitude: 0° 1' 24.96" N (0.0236°)

Longitude: 37° 54' 22.32" E (37.9062°)

Technologies and/or measures

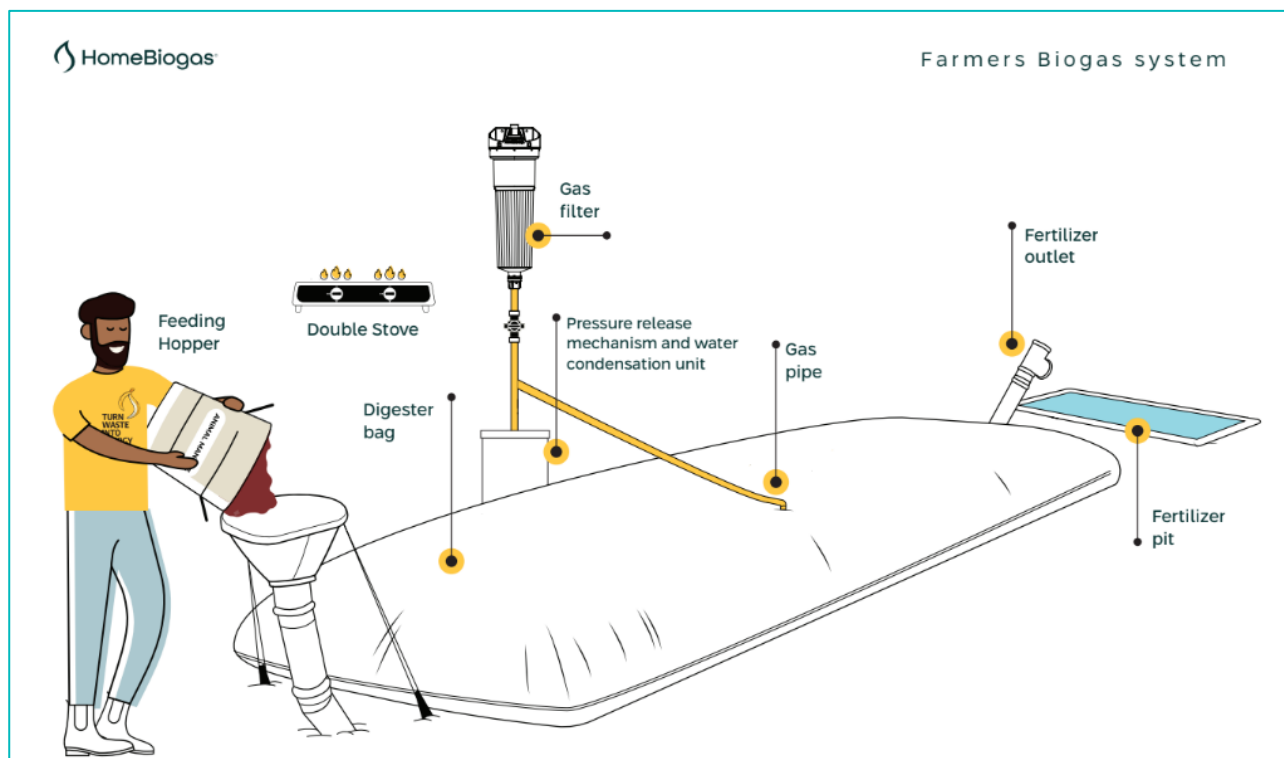
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The balloon type biodigesters technology is used in the current VPA. This type digesters are pre-fabricated modular semi-continuous flow type hybrid reactors that are made of UV protected polypropylene. The accessories and pipes are made of hydraulic PVC and HDPE (High-density polyethylene) material. In addition to the basic connections, H₂S filter, pressure release valves and the water condensate trap are provided to ensure safe functioning of the system. An additional geotextile lining is provided which is placed below the reactor to protect the unit from rodents and other such issues. The technical specification of the 2.5 m³ digesters are given below:

Type of digester	Balloon
Manufacturer	HomeBiogas
Model	Farmers Biogas System
Gas output (design capacity)	2.5 m ³
Digester Volume	5.5 m ³
Gas Storage Volume	2.5 m ³
Bio-fertilizer daily Production (LPD)	150 Liters
Dung to water ratio	For Cow dung: 1:2 For swine dung: 1:4

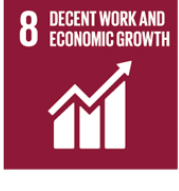
Digester material	UV protected Polypropylene
Stove type	2 burner stove
Ancillaries	Pipes, Stove, Connectors, Nylon sheet, feeding hopper, bucket and parts bag.
Lifetime	15 years

Parts of the digesters



Positive contribution of the proposed biogas technology to at least three SDGs.

1 NO POVERTY	Access to basic services, ownership and appropriate new technology - The biodigester provided to each household is more efficient and it requires less maintenance compared to the baseline stove. Therefore, each household participating in the project activity will not only have access to clean cooking devices but will also have less maintenance issues due to an appropriate improved household size biogas model. The biogas units will be fully owned by each household participating in the proposed project activity. The biogas units will also result in
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	savings through either spend on firewood purchase or using the time saved from firewood collection for revenue generating activities.
	HomeBiogas system's liquid bio-fertilizer has demonstrated excellent economic and operational efficiency. Farmers reported higher crop yields, a stronger natural flavor, larger harvests, healthier and more fertile soil, and less need for pesticides
	The use of biogas for daily cooking needs will directly replace of the firewood, which has been a principal cause for indoor air pollution. Therefore, the project activity will reduce the illnesses from indoor air pollution by providing access to clean cooking technologies. The women will specifically benefit from the project activity due to clean environment for indoor cooking and also reduced burden to collect/buy firewood for cooking.
	Due to the use of HomeBiogas Digesters the time consumed for collecting firewood and cooking using traditional methods in the baseline scenario is being saved. This gives women in the house, ample time to invest in other activities. HomeBiogas promotes equal employment opportunities and complies with legal requirements for fair and equal employment. HomeBiogas also empowers and promotes women, who comprise 33% of all company employees and 29% of the board of directors.
	The proposed project activity with clean cooking units for each participating household, therefore it directly ensures access to an affordable, reliable and cleaner form of energy for daily cooking demand of each of these households.
	The project will create at least 200 jobs in the project region. The programme will also train many local people in biogas technology. The trained biogas technicians will be permanently employed by the VPA implementer. The project will also create indirect jobs at the manufactures of bio-digesters.

	The project will reduce GHG's emissions by two approaches, firstly by replacing the use of firewood by biogas for daily cooking needs. Secondly using the available animal dung in the biodigester, which otherwise would have dumped and left to decay leading to methane emissions.
	The project beneficiaries are highly dependent on firewood for daily cooking. The use of the biogas for cooking will reduce the use of firewood and decrease in the use and demand of wood, which will eventually lead to sustainable forests in the project area.

Scale of the VPA

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The VPA is a Largescale project activity.

TYPE 1:

The total thermal energy generation from the project activity

Details	Value	Unit	Reference
Overall efficiency of biogas burners	55%		Assumptions
Calorific Value of biogas	21.6	MJ/m ³	
Rate of biogas discharge	0.5	m ₃ /hr	Stove Manufacturer specification
	0.000139	m ³ /s	Calculated
Thermal Energy output rating of the biogas stove	0.00165	MW _{th}	Calculated
Number of stoves	50000	Nos.	Project design
Total thermal Energy output by the project	82.5	MW _{th}	Calculated

The project total thermal energy output is greater than SSC limit (45 MW thermal).

TYPE III:

Details	Value	Unit	Reference
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Average emission reduction from manure management	5.57	tCO ₂ e/year/unit	ER calculation sheet
Total number of digesters	50,000	Nos	Project design
Total emission reduction from manure management	278,338	tCO ₂ e/year	Calculated

The estimated emission reduction from manure management is greater than type III SSC limit (60,000 tCO₂e/year)

Funding sources of VPA

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The project activity is completely funded by HomeBiogas, a private entity. The project devices (Bio-digesters & biogas stove) will be provided to the beneficiary by HomeBiogas at a subsidised cost. The GS VER's generated by the project activity will be owned by HomeBiogas.

SECTION B. APPLICATION OF APPROVED GOLD STANDARD METHODOLOGY (IES) AND/OR DEMONSTRATION OF SDG CONTRIBUTIONS

Reference of approved methodology (ies)

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Gold Standard Methodology: Methodology for Animal Manure Management and Biogas Use for Thermal Energy Generation, Version 1.1

Additional Guidelines Referred:

Cookstove Usage Rate Guidelines, version 2.0

Applicability of methodology (ies)

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Applicability	Justification
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The livestock population in the farm is managed fully or partly under confined conditions;	The livestock are managed entirely in a confined conditioned. The cattle are kept in shed for 24 hours. Evidence: Baseline survey results.
Manure or the streams obtained after treatment are not discharged into natural water resources (e.g., river or estuaries);	Manure is not discharged in the natural water-bodies instead converted in to liquid bio-fertilizers and used for land application and the same will be monitored during ex-post. Evidence: The slurry application is included as monitoring plan in section B.7 of VPA-DD.
The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	The annual average temperature in Kenya is 25°C degrees Celsius which is higher than 5°C.
In the baseline scenario, the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m;	The average retention time of manure in pit/heap in the baseline condition is 3.34 month which is more than one month, and the depths are 1 m or more. Evidence: Baseline survey results.
The baseline scenario should not involve methane recovery and destruction by flaring or combustion for gainful use.	There is no methane recovery in the baseline as the cattle dung is directly dumped in open pits. Evidence:

	Baseline survey results.
The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project developer can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	The manure is available from the cattle shed which is near to the house and the manure removal from the cattle shed and fed into digester on daily basis and hence there is no transportation and storage of feedstock involved Evidence: Baseline survey results.
A technical measure to ensure that the gas holding capacity of the biodigester is sufficiently large to capture the biogas during periods of non-usage. A justification to demonstrate compliance with this requirement pertaining to the biogas digester size shall be included in the Project Design Documentation (PDD).	The biogas is used daily for the household cooking. There are no non-usage days involved. Hence this condition is not applicable.
The activity is implemented by a project developer and can include additional project participants listed in Appendix 2 of the PDD template. The individual households may be represented collectively by community organisations, etc., but do not individually act as project participants	The CME is the project developer and no additional participants are involved. The contact details of CME has been included in Appendix 2 of the PDD Evidence: Appendix 2 of PDD.

The developer must design incentive mechanism(s), which should be effective as fast as possible, for the displacing the use of inefficient baseline stoves or cooking practices by the project cooking devices for daily usage and describe the incentive mechanism(s) in the PDD/VPA-DD at the time of validation.	The baseline technology (3 stones stove or mud stove for firewood use) in the project activity will be replaced by the use of biogas for daily cooking. The biogas gas is a clean cooking technology which results in reduction in some, reduction in cooking time, fuel wood collection time & utensils cleaning time. This itself act as encouraging factor to use biogas system. Additionally, to encourage the complete removal of old technology, the biodigesters are given to the beneficiary at subsidized cost. Also, to assure the continuous use of the biogas, beneficiaries will be trained in maintenance of the system. Also, CME will do annual survey to check the usage of old technology and deduct the same from the emission reduction.
To avoid double counting or double claiming, the project developer must: a. clearly communicates its ownership rights and intention of claiming the emission reductions resulting from the project activity to the following parties by contract or clear written assertions in the transaction paperwork: all other project participants; project technology manufacturers; and	a. An end-user agreement has been signed with the beneficiary explaining in local language the ownership rights of the emission reductions resulting from the project. Evidence: End user agreement b. The end users have been notified about the emission reduction rights during the stakeholder meeting Evidence: LSC report

retailers of the project technology; and b. informs and notify the end users that they cannot claim emission reductions from the project, and c. excludes from the project activity, any biodigester and cookstoves that are included in any other voluntary market or CDM or Article 6 based mechanisms project activity/PoA and strive not to displace the cooking devices of another CDM or voluntary project/PoA. See data and parameters not monitored (section 3.11), Avoidance of double counting or double claiming with other mitigation actions (BGTA 2), for details on this demonstration.	c. The VPA, nor any of its devices is not yet registered and not being registered as a standalone CDM project by ensuring that the VPAs has the full title over the emission reductions generated by the users listed in the VPA. Evidence: Declaration on double counting
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VPA boundary

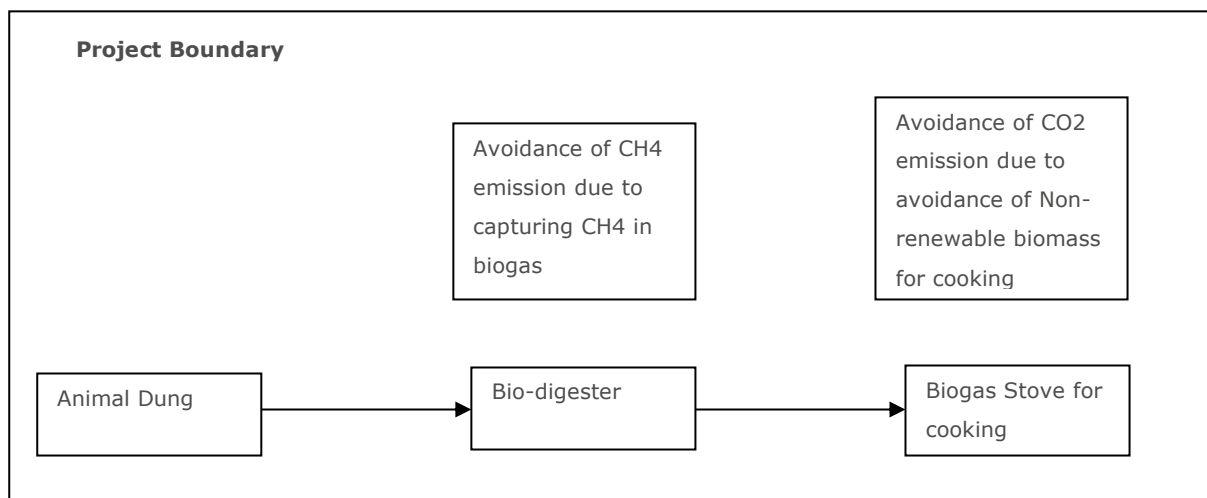
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As per the GS methodology “Methodology for Animal Manure Management and Biogas Use for Thermal Energy Generation”, The project boundary is the physical, geographical sites of the project technologies/practices including the fuel collection and production area:

- a. The livestock;
- b. Animal manure management systems;
- c. Biogas utilisation for thermal applications;

d. Digestate treatment, usage and/or disposal (where applicable).

The project boundary is delineated below:



Source	GHGs	Included?	Justification/Explanation
Baseline scenario	Animal Waste Management System	No	CO ₂ emissions from the decomposition of organic waste are not included.
		Yes	CH ₄ Major source of emissions.
		No	N ₂ O Excluded for simplification and conservative.
	Delivery of thermal energy	Yes	CO ₂ Important source of emissions
		Yes	CH ₄ Important source of emissions, unless justified negligible.
		Yes	N ₂ O Can be significant for some fuels, unless justified negligible.
	Animal Waste Management system	No	CO ₂ CO ₂ emissions from the decomposition of organic waste are not included.

Project		CH ₄	Yes	Emissions from physical leakage, as well as emissions from the animal waste not treated in the bio-digester.
		N ₂ O	No	Excluded as a biodigester does not produce N ₂ O gasses.
	Delivery of thermal energy	CO ₂	No	Negligible emission
		CH ₄	No	Negligible emission
		N ₂ O	No	Negligible emission

Establishment and description of baseline scenario

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1. To determine the baseline scenario of the project activity the baseline survey was conducted to understand the below components: Fuel used for cooking among the target population
2. Animal waste management practiced in the target population

Baseline survey

Baseline survey sample sizing –

As per the guidelines provided in the GS methodology, the minimum sample size criteria are as follows –

Group size < 300	Minimum sample size 30 or group size whichever is smaller
Group size 300 to 1000	Minimum Sample size 10% of group size
Group size > 1000	Minimum Sample size 100

Since the group size is greater than 1000, the minimum sample size required as per the applied methodology is 100. However, a total of 225 households were surveyed to identify the baseline scenario for the proposed project activity. The sampled households were surveyed in person for the target areas. The interviewers included both men and women depending on the person available at the time of the visit of the survey members.

Data Collected

The data collected during the baseline survey include the following information –

1. Address location
2. Mobile number or landline number (if available)
3. Number of people served by the baseline technology
4. Types of fuels used for cooking and estimated quantities
5. Sources of fuels; (purchased or hand-collected, etc)
6. Type of the animal waste management system practiced by the end-users
7. Animal category and total number of animals owned by each household in each category
8. Time spent by the animals for grazing and in shed and
9. Average amount of the animal dung collected and dumped in the pits and or heaps.

From the data collected during the baseline survey, it can be stated about 84.4% of the surveyed population primary depends on firewood for daily cooking needs. It has been observed that some households also use other fuels like – charcoal & LPG as primary fuel for both cooking and heating water.

As per the baseline survey results, average firewood used is 8.63 kg per day, 0.08 kg/day of charcoal and 0.05 kg of LPG for cooking & water heating. No kerosene or any other fuel consumption for cooking is reported by any households. As per the para 4.4.5 (a) of the methodology, the confidence/precision level required for the sample parameters are 90%/30%. The precision level achieved is calculated as below:

Fuel	Fuel Wood	LPG	Charcoal
Total	1830	4501	18.
Mean	8.133	20.004	0.080
Standard Deviation	3.31	26.75	0.45
90% Confidence	1.645	2.645	3.645
V	0.17	1.79	32.13
N	225	225	225
Achieved precision level	4.5%	23.6%	137.7%
Remarks	Precision level met	Precision level met	Only 7 cases use charcoal as primary fuel (ie, 3.1%). Hence not appropriate to calculate the

			precision level. Moreover, the same is again determined through KPT. Refer below.
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Though the baseline fuel consumption is determined through baseline survey, the fuel wood and charcoal consumption has been determined through Kitchen performance test (KPT). The sample size for KPT has been calculated with 90/30 confidence/precision level considering the expected mean & standard deviation from the data derived from baseline survey. The sample size calculation is given below:

Expected Mean (kg)	8.1
Expected SD	3.3
90% confidence	1.645
30% relative precision	0.3
v	0.166
n	5.0

As per above calculation, the minimum sample size required is 5. However, we have conducted 41 households (32 households using fuel wood and 9 household using charcoal). The test has been conducted continuously for three days in these households and the result and precision level achieved as given below:

Fuel Type	Fuel Wood	Charcoal
Total	61.900	5.217
Mean	1.934	0.580
Standard Deviation	0.57	0.22
90% Confidence	1.645	1.645
V	0.09	0.14
N	32	9
Achieved precision level	8.5%	20.8%
Remarks	Precision level met	Precision level met

The KPT results achieve required precision level of 30%. Please refer the ER calculation sheet.

Regarding the animal waste management system, the survey data shows that collecting and dumping the animal dung in open pits is a common practice of each household. The open pits are mostly found near the animal sheds, where the dumped dung is left to decay without turning/mixing, creating anaerobic conditions leading to methane emissions. The survey results show that each household have on an average of 5.121 dairy cow and 0.569 market swine. These animals are 24 hours kept in cattle-shed and are not fed on grazing.

Animal type	Dairy Cow	Market Swine
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Total	1142	128
Mean	5.121	0.569
Standard Deviation	2.77	2.93
90% Confidence	1.645	2.645
V	0.29	26.47
N	223	225
Achieved precision level	6.0%	90.7%
Remarks	Precision level met	Only 8 cases has market swine (ie, 3.6%). Hence not appropriate to calculate the precision level.

The project activity aims to provide biogas unit to each target household in the project activity. The biogas produced will be used for cooking and/or for heating water depending on daily energy demand of the household. And secondly, the use of the animal dung in the biodigester will replace the usual practice of dumping the dung in open pits.

Therefore, the baseline scenario in the absence of the project activity is using firewood for cooking on inefficient stoves and dumping of the cattle dung directly into the open composting pits.

Calculation of F_{NRB}

Determining Non-renewable biomass (f_{NRB})

As per Tool 30 “calculation of the fraction of non-renewable biomass - V 04.0” two options can be used to determine the value of f_{NRB} ;

(a) Use the default value as provided in TOOL33⁴ or

(b) Calculate f_{NRB} by determining the share of renewable and non-renewable woody biomass in the total quantity of woody biomass consumption for the country/region or the project area (hereinafter referred as the applicable area) following the procedure and requirements in the paragraphs below. The project participants shall compare and analyse the calculated values against the values for f_{NRB} reported in relevant

⁴ The default f_{NRB} value of 0.3 may be used irrespective of the versions of the applicable methodology (e.g. AMS-I.E., AMS-II.G., AMS-III.Z., AMS-III.AV., AMS-III.BG.).

scientific literature and justify any differences. This analysis shall be included in the appropriate section of the PDD

PP chose 'Option B' for determination of the fNRB. As estimating fNRB for the collection area is difficult as the data is not available, project proponent has aggregated all reachable woody biomass fuel collection areas within the project state and apply a single fraction derived from all collection areas in the state.

Determining f_{NRB}

The fraction of woody biomass that can be established as non-renewable is

$$f_{NRB} = \frac{NRB}{NRB + RB}$$

Where

fNRB = Fraction of non-renewable biomass in the applicable area in the relevant period (fraction or %)

NRB = Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)

RB = Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)

CDM Tool 30: Methodological Tool for calculation of the fraction of non-renewable biomass, version 3 provides detailed procedure for calculation of NRB & RB.

Determination of NRB

Since, the project is located in the Kenya, the fNRB is calculated for Kenya.

As per para 11 of the Tool 30, the NRB is calculated as below for region-specific basis (ie, Kenya):

$$NRB = H - RB$$

Where

H = Total consumption of woody biomass in the applicable area in the relevant period (tonnes)

As per Para 14 of the Tool, H is calculated as below

$$H = HW \times N + CE + NE$$

Where,

- HW Average consumption of wood fuel per household, including fuelwood and charcoal, in the applicable area in the relevant period (tonnes//household)
- CE Commercial woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of woody biomass in ovens, boilers etc.) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)
- NE Commercial woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)
- N Number of households consuming wood fuel within the applicable area in the relevant period (number)

Parameter	Value	Data Unit	Data Source
Total wood consumption	54,406,000	m3	http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW
Total wood consumption	31,619,146.6	t/year	Calculated
H (total annual consumption of wood (fuel + other))	31,619,146.6	t/year	Calculated

Determination of RB

As per para 19 of the Tool 30, Renewable biomass (RB) in the country/region/project area is estimated using the equation below.

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other}))$$

Where,

$MAI_{forest,i}$ = Mean Annual Increment of woody biomass growth per hectare in subcategory i of forest areas (t/ha/yr)

$MAI_{other,i}$ = Mean Annual Increment of woody biomass growth per hectare in subcategory i of other wooded land areas (t/ha/yr)

$F_{forest,i}$ = Extent of forest in sub-category i (ha)

$F_{other,i}$ = Extent of other wooded land in sub-category i (ha)

P_{forest} = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (ha)

P_{other} = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas (ha)

i = Sub-category i of forest areas and other wooded land areas

However, Mean Annual Increment of different category of forest & wooded land is not available publicly. the values of $\sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest}))$ and $\sum (MAI_{other,i} \times (F_{other,i} - P_{other}))$ are directly taken from the Global Forest resource assessment 2015.

MAI(forest)	0.793333333	m3/ha/year	Average value from closed forest (1.3 m3/ha/year), woodlands (0.64 m3/ha/year); and bushlands (0.44 m3/ha/year) since all are considered to have a canopy cover of at least 40%, hence are considered as forest as per Kenya's DNA forest definition (https://cdm.unfccc.int/DNA/index.html) Data Source: GTZ Eastern Africa Online Resource Base (https://energypedia.info/wiki/Biomass_Energy_Resources_in_Kenya)
MAI (other wooded land)	0.25	m3/ha/year	For other wooded lands the value for wooded grasslands (0.25 m3/ha/year) as indicated in 'Energypedia' is used. Wooded grasslands are described as areas with a 10-40% woody vegetation cover, hence predominantly fall under 'other wooded land' as per Kenya's DNA forest definition (https://cdm.unfccc.int/DNA/index.html); Data Source: GTZ Eastern Africa Online Resource Base (https://energypedia.info/wiki/Biomass_Energy_Resources_in_Kenya)
MAI (other land)	0.08	m3/ha/year	A MAI of 0.08 m3/ha/year has been assumed for 100% of other land. To take 100% of other lands is conservative, since only a certain proportion of other lands provide supply of woody biomass. The MAI of 0.08 m3/ha/year has been sourced from GTZ Eastern Africa Online Resource Base (https://energypedia.info/wiki/Biomass_Energy_Resources_in_Kenya) and is the one for grasslands.
MAI (forest)	0.461061702	t/ha/year	Calculated based on MAI value (m3/ha/year) and average density of 282 different tree species for tropical Africa (source: http://www.fao.org/3/W4095E/w4095e0c.htm) / See detailed Density list in worksheet 'fNRB tree densities'
MAI (other wooded land)	0.145292553	t/ha/year	Calculated based on MAI value (m3/ha/year) and average density of 282 different tree species for tropical Africa (source: http://www.fao.org/3/W4095E/w4095e0c.htm) / See detailed Density list in worksheet 'fNRB tree densities'
MAI (other land)	0.046493617	t/ha/year	Calculated based on MAI value (m3/ha/year) and average density of 282 different tree species for tropical Africa (source:

			http://www.fao.org/3/W4095E/w4095e0c.htm / See detailed Density list in worksheet 'fNRB tree densities'
Non accessible areas (protected areas)	1,32,218	km ²	Protected land areas of Kenya from Protected Planet Website, Kenya national website, download main dataset and add the "REP_AREA" column: https://www.protectedplanet.net/country/KE
Non accessible areas (protected areas)	1,32,56,900	ha	Calculated
P(forest)	796,459	ha	Calculated
P (other wooded land)	7,459,170	ha	Calculated
P (other land)	4,966,187	ha	Calculated
RB (Renewable biomass)	5,536,464	t/year	Calculated

The f_{NRB} calculation is provided below:

Determination of fNRB for Kenya		
Consumption (tonnes) - H	31,619,146.6	Calculated
Renewable Biomass (tonnes) - RB	5,536,464	Calculated
Non-Renewable Biomass, (tonnes) - NRB	26,082,683	Calculated
$f_{NRB} = (NRB/NRB+DRB)$	0.8249	Calculated

The f_{NRB} determined for Kenya is 0.8249.

Comparison with published literature:

As per the report 'The carbon footprint of traditional woodfuels' by Bailis, R.; Drigo, R.; Ghilardi, A. & Masera, O. (2015)⁵ -Figure 2, the f_{NRB} of Kenya is in the range of 61–70%. However, we have estimated f_{NRB} of 82.49% which is mainly due to the following reasons:

1. The f_{NRB} calculated in this report is not as per the CDM Tool 'Calculation of the fraction of non-renewable biomass'

⁵ https://www.nature.com/articles/nclimate2491.epdf?no_publisher_access=1&r3_referer=nature

2. The fuel wood consumption data is based on the 2009 data which is very old
3. The model accuracy is unknown.

Also estimated above is lesser than the fNRB values approved by UNFCCC6 (ie, 92%) which was valid till 18th September 2017. Also as per the report 'Getting the numbers right: revisiting woodfuel sustainability in the developing world' published by Rob Bailis, Yiting Wang, Rudi Drigo , Adrian Ghilardi and Omar Masera7 (Figure 3), the fNRB of Kenya is >90% which is higher than the value estimated above Hence, the value estimated above is conservative.

Demonstration of additionality

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The additionality of the project has been justified as per GS4GG Community Services Activity Requirements, v1.2. The project type as per para 2.1.1 the community service activity requirement is justified as below:

2.1.1 All Community Service Activities (CSA – as defined in this document) for which Gold Standard certification is being sought shall fulfil the requirements as set out in this document and those referenced or associated.	The VPA is a community service activity (CSA) and requirements as set out in GS4GG Community Services Activity Requirements, v1.2 and those referenced are justified below.
2.1.2 All CSA Projects shall lead to climate change mitigation and/or adaptation by providing or improving access to services/resources at the household or community or institution level. Eligible services include electricity and energy, water and sanitation, waste management, housing, etc.	The VPA avoids GHG gases (CO2 & CH4) by providing the bio digesters to the households. The bio-digesters uses animal dung as feed and the biogas generated from the digester will be used for cooking. In baseline condition, fuel wood and LPG are used for cooking and the animal dung was managed at open pits & piles. So, the VPA provide services

⁶ <https://cdm.unfccc.int/DNA/fNRB/index.html>

⁷ https://www.researchgate.net/publication/320676536_Getting_the_numbers_right_Revisiting_woodfuel_sustainability_in_the_developing_world/link/6229f63f84ce8e5b4d15aa95/download

	of energy and waste management. Hence, the project type is eligible as CSA.
2.1.3 In relation to the above, all Projects shall, therefore, conform to the Principles & Requirements (and associated documents).	The VPA satisfies general eligibility criteria as described in GS4GG Principles & Requirements, v1.2. Please refer section A.2 for the justification.

Hence, the project type is eligible under CSA.

The general eligibility criteria for CSA requirements are justified as below:

Project Type	As per the Community Services Activity Requirements v-1.2 section 3.1.1 the project involves waste management activities that deliver energy or a usable product with sustainable development benefits such as composting, biogas etc. Hence the project type is: (c) Waste management and handling
Project area, boundary and scale	The project boundary is the physical, geographical sites of the project technologies (bio-digester & stove) and potentially of the baseline and project fuel collection which is as per the gold standard methodology "Methodology for Animal Manure Management and Biogas Use for Thermal Energy Generation, V1.1. The project boundary is defined in section B.3 i.e., The project boundary specifically includes bio-digesters, biogas stove, baseline manure management system and baseline fuel collection Hence, the project area and boundary are defined in line with the applicable Impact Quantification Methodologies. The VPA is not a micro-scale project activity as the annual emission reduction is more than 10,000 tCO ₂ e.
Legal ownership:	The project devices (Bio-digesters & biogas stove) will be provided by HomeBiogas at Subsidized cost. Beneficiaries will be considered as legal owners of the project devices. However, the social benefits

	and VERs will be with HomeBiogas and HomeBiogas will sign a detailed End user agreement mentioning all the criteria with all the end-user beneficiaries before the commissioning of the project devices (Bio-digesters). The transfer of ownership was discussed during the stakeholder consultation meeting. Except the Social benefits and VERs, all other legal rights of the project devices are with the beneficiaries.
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Hence, the VPA fulfils all the general eligibility criteria for CSA requirements.

The proposed project is a type of project that is deemed additional as per the GS4GG Community Services Activity Requirements, Version 1.2. The justification is provided in the below table.

Specify the methodology, activity requirement or product requirement that establishes deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	Para 4.1.9 of GS4GG Community Services Activity Requirements, Version 1.2: <i>"Projects that meet any of the following criteria are considered as deemed additional and therefore are not required to prove Financial Additionality at the time of Design Certification:</i> <i>(a) Positive list (Annex B)</i> <i>(b) Projects located in LDC, SIDS, LLDC</i> <i>(c) Microscale projects"</i> Para 1.1.3 of 'Annex B –Positive List' in GS4GG Community Services Activity Requirements, Version 1.2: "Project activities solely composed of isolated units where the users of the technology/measure are households or communities or institutions and where each unit
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	results <=600 tonnes of emission reductions per year”
Describe how the proposed project meets the criteria for deemed additionality.	project technology (biogas systems for cooking) has been implemented in individual households and every unit results in the emission reduction of 9.05 tCO₂/yr which is less than 600 tonnes of emission reductions per year. As per the GS4GG Community Services Activity Requirements, the project activity falls under the positive list, since the emission reduction per unit is < 600 tonnes of emission reductions per year. Hence, the project is deemed additional

B.1.1. Prior Consideration

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The project start date is the 01/02/2022 which is the date of starting construction of first digester. The first submission of the project documents to preliminary review is 10/01/2023 which is within in 1 year of start of the project. Hence, the project fulfils the prior consideration requirements.

B.1.2. Ongoing Financial Need

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Not applicable

Sustainable Development Goals (SDG) outcomes

Relevant Target/Indicator for each of the SDGs

Sustainable Development Goals Targeted	Most relevant SDG Target	SDG Impact
		Indicator (Proposed or SDG Indicator)

13 Climate Action (mandatory)	13.2: Integrate climate change measures into national policies, strategies and planning	Amount of GHG Emission reduction
1 - End poverty in all its forms everywhere	1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	Proportion of population living in households with access to basic services
2 – Zero Hunger	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.	Number of farmers adopted practices promoted by the project
3 – Ensure healthy lives and promote well-being for all at all ages	3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	Percentage of project population using polluting fuels

5 – Women Empowerment	5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate Average time saving associated with cooking time and fuel collection
7 – Ensure access to affordable, reliable, sustainable and modern energy for all	7.1: By 2030, ensure universal access to affordable, reliable and modern energy services Number of beneficiaries: Households
8 – Promote inclusive and sustainable work for all women and men, economic growth, including for young people and employment and decent work for all	8.5: By 2030, achieve full and productive employment and decent pay for work of equal value Total Number of Jobs
15 – Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss	15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally Total non-renewable wood fuel saved

B.1.3. Explanation of methodological choices/approaches for estimating the SDG Impact

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SDG 1 – End poverty in all its forms everywhere

From the baseline survey it is observed that the target project beneficiaries do not have access to clean and affordable form of energy to meet their daily cooking needs. It can be observed that most of the families are highly dependent on the use of firewood for cooking. No households of the target population in the project area have access to the biogas technology (reference section B.5). The aim of the project outcome is to provide a biogas unit to each family participating in the project. The methodology used to estimate the SDG outcome will be through the monitoring surveys.

Monitoring parameter	Number of beneficiaries: Households
Baseline estimation approach	This is determined through baseline survey. As per baseline survey no households in target population have biogas units.
Project Estimation approach	The Number of households where the bio digesters are operational are monitored annually (or more frequently) through monitoring survey (sample survey)
Net estimation approach	Net benefit = Project estimate – Baseline estimate

SDG 2– Zero Hunger

HomeBiogas system's liquid fertilizer has demonstrated excellent economic and operational efficiency. Farmers reported higher crop yields, a stronger natural flavor, larger harvests, healthier and more fertile soil, and less need for pesticides due to the bio-fertilizer generated from the installed bio-digesters.

Monitoring parameter	Number of farmers adopted practices promoted by the project.
Baseline estimation approach	This is determined through baseline survey. As per baseline survey, selected households did not make use of bio-fertilizers for agriculture. Hence, in the baseline there is no use of bio-fertilizer.
Project Estimation approach	The SDG 2 outcome will be estimated on the total number of beneficiaries, who will use Bio-fertilizers for agriculture land.

	Annual monitoring survey (sample survey) will be conducted among the beneficiary households and percentage of households who confirmed the use of bio-fertilizers will be determined.
Net estimation approach	Net benefit = Project estimate – Baseline estimate

SDG 3– Ensure healthy lives and promote well-being for all at all ages

The target population in the project mostly use firewood for cooking in inefficient traditional cook stoves due to which they are continuously exposed to indoor air pollution. The health of the women is the most affected due to continuous exposure to smoke while cooking. The methodology used to estimate the SDG outcome will be through the monitoring surveys to know the total number of the project beneficiaries agreeing that the indoor air pollution has decreased due to the use of the biogas for daily cooking.

Monitoring parameter	Percentage of project population using polluting fuels
Baseline estimation approach	This is determined through baseline survey. As per baseline survey, about 87.5% households use firewood & Charcoal for cooking in the traditional cook stove which leads to indoor air pollution. Hence, the households, especially the woman are constantly exposed and inhale harmful smoke while cooking. Hence, in the baseline there are no households having reduced indoor pollution.
Project Estimation approach	The SDG 3 outcome will be estimated on the total number of beneficiaries, who will have a clean, smoke free kitchen with the use of biogas for cooking. Annual monitoring survey (sample survey) will be conducted among the beneficiary households and percentage of households who confirmed the reduction in air pollution will be determined.
Net estimation approach	Net benefit = Project estimate – Baseline estimate

SDG 5– Gender Equality

Due to the use of HomeBiogas Digesters the time consumed for collecting firewood and cooking using traditional methods in the baseline scenario is being saved. Also, washing utensils became easier and time saving due to less or no accumulation of soot. This gives women in the house, ample time to invest in other activities. HomeBiogas promotes equal employment opportunities and complies with legal requirements for fair and equal employment. HomeBiogas also empowers and promotes women, who comprise 33% of all company employees and 29% of the board of directors.

Monitoring parameter	Average time saving associated with cooking time and fuel collection
Baseline estimation approach	This is determined through baseline survey. As per baseline survey, about 6.05 hrs spent by households for cooking and fuel wood collection.
Project Estimation approach	Annual monitoring survey (sample survey) will be conducted among the beneficiary households and time spent for cooking and fuel wood collection will be determined.
Net estimation approach	Net benefit = Project estimate – Baseline estimate

SDG 7– Ensure access to affordable, reliable, sustainable and modern energy for all

In the project areas, most of the target beneficiaries are dependent on firewood for cooking. Very few families can afford to buy LPG due to its high costs and the time taken to go and collect it from the nearest city centre. The biogas units will be owned by the households and will be at subsidized price, sustainable and renewable form of energy for meeting their daily cooking needs. The methodology used to estimate the SDG outcome will be through the monitoring surveys to know the total number of project beneficiaries using biogas for daily cooking.

Monitoring parameter	Proportion of population living in households with access to basic services
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Baseline estimation approach	This is determined through baseline survey. As per baseline survey no households in target population have biogas units or any clean cooking devices.
Project Estimation approach	The Number of households where the bio digesters are installed are monitored continuously and recorded in project database as and when a bio digester is installed.
Net estimation approach	Net benefit = Project estimate – Baseline estimate

SDG 8 – Promote inclusive and sustainable economic growth, employment and decent work for all

The project provides new job opportunities during pre-construction (baseline survey), construction and operation of bio digesters. The CME/VPA implementer also train the employees in various areas such as surveying, implementation of bio digesters, repair of bio digesters & monitoring etc. This will improve the skills of the employees which will help them to explore new job opportunities in the future. The CME/CPA implementer also provides training to the beneficiaries in the operation of the bio digesters. In the baseline scenario, no such employments or training would have been provided.

Monitoring parameter	Total Number of Jobs
Baseline estimation approach	In the baseline scenario, no bio digesters would have been installed.
Project Estimation approach	The employment records will be maintained by HomeBiogas.
Net estimation approach	Net benefit = Project estimate – Baseline estimate

SDG 15 – Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

In the baseline the fuel wood is collected from fields and nearby forests and this increase the pressure on the forests. Using biogas units for cooking will completely avoid the fuel wood usage and hence reduce the pressure on the forests. The methodology used to

estimate the SDG outcome will be through the monitoring surveys to know the total number of project beneficiaries who have, first replaced the use of firewood by using biogas for daily cooking and secondly used the Bio-fertilizer for agricultural use to improve the soil quality.

Monitoring parameter	Total non-renewable wood fuel saved
Baseline estimation approach	This is determined from the baseline survey. As per the baseline survey most of the households use fuel wood for cooking which lead to exploiting the forest. As per baseline KPT, average of 3.09 tonnes/year of fuel wood is consumed by each household or 0.89 tonnes/year charcoal (equivalent to 5.36 tonnes of fuel wood) is consumed per household. So about 139,894 tonnes of NRB is consumed by 50,000 households considering fNRB of 92.9%. There is no NRB saving in the baseline.
Project Estimation approach	Project NRB consumption will be determined using KPT during the project scenario and the fNRB. It is expected to be much lower than the baseline estimated due to the use of biogas for cooking.
Net estimation approach	Net benefit = Project estimate – Baseline estimate

For the SDG 13, the emission reduction calculations were carried out as per the applied GS methodology.

The baseline emission involves carbon emission from

1. Fuel used for cooking among the target population
2. Animal waste management practiced in the target population

In order to determine total baseline emissions, the emissions per household are calculated as follows:

$$BE_{b,y} = BE_{ta} + BE_{awms}$$

Where:

$BE_{b,y}$ = Total Baseline emissions for baseline scenario b in year y (tCO₂e/yr)

$BE_{TA,y}$ = Baseline emissions from fuel consumption for cooking and water heating (tCO₂e/yr)

$BE_{AWMS,y}$ = Baseline emissions from animal waste handling (tCO₂e/yr)

I. Baseline emissions from fuel consumption for cooking and heating water are calculated as follows:

The Baseline emission from thermal application in year y shall be calculated as per the methods outlined in paragraph 3.5.12 of the methodology. As per the Thermal application method 1, based on avoided quantity of fuel consumption

$$BE_{TA,y} = \sum_{b,p} (N_{b,p,y} \times U_{p,y} \times (f_{NRB,i,y} \times SE_{b,y,CO2} + SE_{b,y,non-CO2}))$$

Where:

$BE_{TA,y}$	Baseline emissions for total project activity in year y (tCO ₂ e.yr)
$\sum_{b,p}$	Sum over all relevant baseline b/project p pairs
$N_{b,p,y}$	Number of project technology-days included in the project data base for each project scenario in year y. The start date is the day a plant starts producing biogas. A default of 2 weeks may be used for the period from installation date and start date.
$U_{p,y}$	Usage rate for technologies in project scenario pin year y (fraction)
$SE_{b,y,CO2}$	Specific CO ₂ emission for a baseline b technology in year y (tCO ₂ /technology*day)
$SE_{b,y,non-CO2}$	Specific non-CO ₂ emissions for a baseline b technology in year y (tCO ₂ /technology*day)
$f_{NRB,I,y}$	Fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass (fraction).

$$SE_{b,y,CO2} = \sum P_{b,i,y} \times NCV_{b,i,fuel} \times EF_{b,i,CO2}$$

$$SE_{b,y,non-CO2} = \sum P_{b,i,y} \times NCV_{b,i,fuel} \times EF_{b,i,non-CO2}$$

Where,

i	Index for the type of baseline/fossil fuel consumed
$P_{b,i,y}$	Average yearly consumption of baseline fuel i per household before the start of the project activity or at the renewal of each crediting period, whichever is later (tonnes/household/day)

NCV _{b,i}	Net calorific value of the fuels i that is substituted in baseline b (TJ/tonne)
EF _{b,i,CO2}	CO2 emission factor arising from use of fuels i in baseline scenario (tCO ₂ /TJ)
EF _{b,i,non-CO2}	Non-CO2 emission factor arising from use of fuels in baseline scenario (tCO ₂ e/TJ)

$P_{b,i,y}$ may be determined via KPT survey or using number of persons served per household multiplied by default fuel consumption (if the baseline stoves are the conventional types) per person per year (parameter BGTA 20) in baseline scenario.

II. Baseline emissions from Animal waste management systems

The baseline emissions, from animal waste handling have been estimated using the IPCC TIER 2 approach which requires information about the characteristics of the manure and its management systems in the baseline. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure (Bo). The formulae are:

$$BE_{AWMS,y} = N_{b,p,y} \div 365 \times GWP_{CH_4} \times D_{CH_4} \times UF_b \times U_{p,y} \times \sum_k \sum_{j,LT} N_{LT,y} \times B_{0,LT} \times VS_{LT,y} \times MCF_{j,k} \times MS\%_{BL,j}$$

Where:

$BE_{AWMS,y}$	Baseline emissions in year y tCO ₂ e
$N_{b,p,y}$	Number of project technology-days included in the project database for each project scenario in year y.
U_{Fb}	Model correction factor to account for model uncertainties (0.94) ⁸

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Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

$U_{p,y}$	Usage rate for technologies in project scenario pin year y (fraction). For baseline emission calculation at Design Certification, the ex-ante $U_{p,y}$ shall be estimated.
GWP_{CH_4}	Global Warming Potential (GWP) of CH ₄ applicable to the crediting period.
D_{CH_4}	CH ₄ density (0.00067 t/m ³ at room temperature (20 deg celcius) and 1 atm pressure)
LT	Index for all types of livestock
j	Index for animal manure management system
k	Climate region k
$B_{o,LT}$	Maximum methane production potential of the volatile solid generated for animal type LT (m ³ CH ₄ /kg-dm).
$MCF_{j,k}$	Annual methane conversion factor (MCF) for the baseline animal manure management system j by climate region k. (%)
$N_{LT,y}$	Annual average number of animals of type LT in year y (numbers)
$VS_{LT,y}$	Volatile solids production/excretion per animal of livestock LT in year y (on a dry mater weight basis, kg-dm/animal/year)
$MS\%_{oBl,j}$	Fraction of manure handled in baseline animal manure management system j.(%)

III. Project emission calculations:

1. The Project emission from thermal application in year y shall be calculated as follows:

$$PE_y = \sum (b_{p,y} N_{b,p,y} \times U_{p,y} \times (f_{NRB,i,y} \times SE_{p,y,CO_2} + SE_{p,y,non-CO_2}))$$

E_y	Project emissions for total project activity in year y (tCO ₂ e/yr)
$\sum b_{p,y}$	Sum over all relevant baseline b/project p pairs
$N_{b,p,y}$	Number of project technology-days included in the project database for each project scenario in year y
$U_{p,y}$	Usage rate for technologies in project scenario p in year y (fraction)
SE_{p,y,CO_2}	Specific CO ₂ emissions for a project p technology in year y (tCO ₂ /technology*day)

$SE_{p,y,non-CO2}$	Specific non-CO ₂ emissions for a project p technology in year y (tCO ₂ e/technology*day)
$f_{NRB,i,y}$	Fraction of biomass used in year y for project scenario p that can be established as non-renewable biomass (fraction). The parameter $f_{NRB,p,y}$ is excluded from the when the observed project additional fuel is fossil fuel.

$$SE_{p,y,CO2} = \sum P_{p,i,y} \times NCV_{p,i,fuel} \times EF_{p,i,fuel,CO2}$$

$$SE_{p,y,non-CO2} = \sum P_{p,i,y} \times NCV_{p,i,fuel} \times EF_{p,i,fuel,non-CO2}$$

i	Index for the type of project/fossil fuel consumed
$P_{p,i,y}$	Average daily consumption of project fuel i per household (tonnes/household/day)
$NCV_{p,i,fuel}$	Net calorific value of the fuel(s) i that is used in project p (TJ/tonne)
$EF_{p,i,fuel,CO2}$	CO ₂ emission factor arising from use of fuels i in project scenario (tCO ₂ /TJ)
$EF_{p,i,fuel,non-CO2}$	Non-CO ₂ emission factor arising from use of fuels in baseline scenario (tCO ₂ e/TJ)

2. Project Emissions from Animal Manure Management

The project emissions involve emissions from the bio-digester, which include physical leakage and incomplete combustion of biogas, as well as emissions from the animal waste not treated in the bio-digester are calculated as per the following equation:

$$PE_{AWMS,y} = PE_{PL,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$$

$PE_{AWMS,y}$	Project emissions in year y (t CO ₂ e)
$PE_{PL,y}$	Emissions due to physical leakage of biogas in year y (t CO ₂ e)
$PE_{power,y}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y (t CO ₂ e)
$PE_{transp,y}$	Emissions from incremental transportation of input manure for the digesters in the year y (t CO ₂ e)
$PE_{storage,y}$	Emissions from the storage of manure (t CO ₂ e)

Project emission from physical leakage has been calculated as below:

$$PE_{PL,y} = 0.10 \times N_{b,p,y} \div 365 \times U_{p,y} \times GWP_{CH_4} \times D_{CH_4} \times \sum_k \sum_{i,LT} B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{i,y}$$

$PE_{PL,y}$ = Project emissions from physical leakage in year y (t CO₂e) G

WP = Global Warming Potential (GWP) of CH₄ applicable to the crediting period.

D = CH₄ density (0.00067 t/m³ at room temperature (20 °C) and 1 atm pressure) L

T = Index for all types of livestock

i = Index for animal manure management system

k = Climate region k

$B_{0,LT}$ = Maximum methane producing potential of the volatile solid generated for animal type LT .

$MS\%$ = Fraction of manure handled in project animal manure management system i

Since,

$PE_{power,y} = 0$ tCO₂e/year (no electricity is required to operate the digester)

$PE_{transp,y} = 0$ tCO₂e/year (no transportation is involved)

$PE_{storage,y} = 0$ tCO₂e/year (no storage is involved)

Hence,

$$PE_{AWMS,y} = PE_{PL,y}$$

In addition, the project emission form amount of dung that is not treated in the biogas unit are calculated using the baseline emission calculation formula:

$$BE_{AWMS,y} = N_{b,p,y} \div 365 \times GWP_{CH_4} \times D_{CH_4} \times UF_b \times U_{p,y} \times \sum_k \sum_{j,LT} N_{LT,y} \times B_{0,LT} \times VS_{LT,y} \times MCF_{j,k} \times MS\%_{BL,j}$$

Where,

MS%Bl,j - Fraction of manure handled in baseline animal manure management system I in the project scenario.

IV. Leakage

As per methodology, leakage emissions, $LE_{p,y}$, shall be determined following one of two options below.

Option 1: Apply a default adjustment factor of 0.95 to the emission reductions to approximate leakage emissions.

Option 2: The project developer must evaluate the following potential sources of leakage and provide an evidence-based description and preliminary quantification of each potential source and its relevance for the project:

- a. The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or with a higher intensity than would have occurred in the absence of the project.
- b. Members of the population who do not participate in the project, and previously used lower emitting energy sources, instead use the nonrenewable biomass or fossil fuels saved under the project activity.
- c. The project significantly reduces the NRB fraction within an area where other GHG mitigation project activities account for NRB fraction in their baseline scenario.
- d. The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of space heating or by retaining some use of inefficient technology.
- e. By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution with this technology by households who commonly used a technology with relatively lower emissions.

The emission reductions for each of the component (AWMS and thermal energy) are calculated separately as follows:

$$ER_y = BE_y - PE_y - LE_y$$

ER_y Emission reductions in year y (t CO₂e/yr)

<i>BE_y</i>	Baseline emissions in year y (t CO ₂ e/yr)
<i>PE_y</i>	Project emissions in year y (t CO ₂ e/yr)
<i>LE_y</i>	Leakage emissions in year y (t CO ₂ e/yr)

B.1.4. Data and parameters fixed ex ante

BGTA 1

Data/parameter	Avoidance of double counting or double claiming among project participants.
Unit	NA
Description	Evidence of avoidance of double counting or double claiming with other parties directly involved with the project or programme.
Source of data	Written assertions with the project developer of the ownership rights and intention of selling the emission reductions resulting from the project activity directed at or signed with all end users
Value(s) applied	No double counting involved
Choice of data or Measurement methods and procedures	NA
Purpose of data	To avoid double counting
Additional comment	As HomeBiogas is the manufacture of biogas system as well as project and distributing directly to the households, there is no other project participant or retailers are involved in this project. The agreement signed with all end users will be provided to VVB at the time of verification.

BGTA 2

Data/parameter	Avoidance of double counting or double claiming with other mitigation actions
Unit	NA
Description	Review and analysis of mitigation actions in other voluntary market or UNFCCC/compliance mechanism
Source of data	Using publicly available information from Gold Standard and other voluntary standards, at a minimum Verra and any recognised national or regional standards in the project location, and UNFCCC CDM project & PoA database: - identify and list any mitigation actions of similar technology, i.e., that provide the same kind of output and use the same kind of equipment or conversion process, operating in overlapping spatial boundaries. If one or more are identified: - describe the practices that will be implemented to ensure that the programme or project activity quantifies emission reductions only from technology it has implemented, - describe the practices to avoid that the programme or project activity implementation displaces technology of other mitigation actions, and - design a method to discount emission reductions in case the programme or project activity is found to displace or operate alongside another mitigation action
Value(s) applied	The digesters are manufactured by HomeBiogas and all end users signed agreement with HomeBiogas hence not part of in any other registered project. Hence, no double counting involved.
Choice of data or Measurement methods and procedures	NA
Purpose of data	To avoid double counting

Additional comment	-
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BGTA 3

Data/parameter	Regulatory framework for provision of animal waste management and thermal energy services.
Unit	NA
Description	Evidence that the project does not undermine or conflict with any national, sub-national or local regulations or guidance for thermal energy supply/devices or fuel supply or use
Source of data	List and provide a summary of any national, sub-national and local regulations or guidance for provision of thermal energy services/devices of the type the project provides in the project boundary, including any tariff requirements. Describe how the project complies with the regulatory framework.
Value(s) applied	No regulatory framework for provision of animal waste management and thermal energy services are available in Kenya
Choice of data or Measurement methods and procedures	NA
Purpose of data	NA
Additional comment	This check will be undertaken at the start of each crediting period

BGTA 4

Data/parameter	Project technology description
Unit	NA

Description	The detailed description of the project technology (including both biodigester and biogas stove) shall include as a minimum: - manufacturer name (if applicable), - product name (if applicable), - technology type, - capacity characteristics (e.g., volume of digester), - continuous useful energy output demonstration, - rated thermal efficiency of biogas stove, - any performance certifications from national standards body or certification body recognized by national standards body also shall be provided.
Source of data	Manufacturer specifications
Value(s) applied	Refer section A.3 above
Choice of data or Measurement methods and procedures	NA
Purpose of data	NA
Additional comment	NA

BGTA 5

Data/parameter	Expected technical life of project technology
Unit	Years
Description	The expected technical life of an individual project technology shall be defined in the PDD.
Source of data	Manufacturer specifications
Value(s) applied	15 years
Choice of data or Measurement methods and procedures	NA

Purpose of data	NA
Additional comment	The lifetime is higher than the crediting period.

BGTA 6

Data/parameter	Baseline scenario survey results.
Unit	NA
Description	Report of the results of the baseline scenario survey.
Source of data	Baseline Survey Sheet
Value(s) applied	Refer section B.4 above
Choice of data or Measurement methods and procedures	NA
Purpose of data	To Calculate the baseline emission
Additional comment	NA

BGTA 7

Data/parameter	GWP _{CH4}
Unit	tCO ₂ e per tCH ₄
Description	Global Warming Potential (GWP) of methane applicable to the crediting period
Source of data	IPCC ⁹

⁹ <https://www.goldstandard.org/project-developers/standard-documents>

Value(s) applied	28
Choice of data or Measurement methods and procedures	As the crediting period starts after 31st December 2020, the result of GWP value IPCC AR5 report is applicable.
Purpose of data	To Calculate the baseline & project emission
Additional comment	The value shall be updated according to any future COP/MOP decisions.

BGTA 8

Data/parameter	$MS\%_{Bl,j}$											
Unit	%											
Description	Fraction of manure handled in baseline animal manure management system j											
Source of data	Baseline Survey											
Value(s) applied	<table><tr><th>Parameter</th><th>dairy_cow</th><th>Market_Swine</th></tr><tr><td>MS%Bl, ,liquid/slurry/Pit-storage</td><td>99.11%</td><td>99.11%</td></tr><tr><td>MS%, Daily Spread</td><td>0.89%</td><td>0.89%</td></tr></table>			Parameter	dairy_cow	Market_Swine	MS%Bl, ,liquid/slurry/Pit-storage	99.11%	99.11%	MS%, Daily Spread	0.89%	0.89%
Parameter	dairy_cow	Market_Swine										
MS%Bl, ,liquid/slurry/Pit-storage	99.11%	99.11%										
MS%, Daily Spread	0.89%	0.89%										
Choice of data or Measurement methods and procedures	Taken from baseline survey and hence it is project specific value.											
Purpose of data	To Calculate the baseline emission											
Additional comment	The value shall be updated according to any future COP/MOP decisions.											

BGTA 10

Data/parameter	$VS_{rate,LT}$
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Unit	kg VS / (1000 kg animal mass) / day
Description	Default Volatile solids production/excretion rate per animal of livestock LT in year y.
Source of data	IPCC Default Value Default values from table 10.13A of chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2019 IPCC Guidelines for National Greenhouse Gas Inventories ¹⁰
Value(s) applied	Dairy Cow: 15.2 Market Swine: 8.7
Choice of data or Measurement methods and procedures	IPCC value is taken as the country specific value is not available
Purpose of data	To Calculate the baseline emission
Additional comment	-

Data/parameter	$VS_{rate,LT}$
Unit	(1000 KG ANIMAL MASS)-1 DAY-1)
Description	Default values for volatile solid excretion rate.
Source of data	IPCC Default Value Default values from table 10.13A of chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and

¹⁰ Table 10.13.A https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

	other Land use' of the 2019 IPCC Guidelines for National Greenhouse Gas Inventories ¹¹
Value(s) applied	Dairy Cow: 15.20 Market Swine: 8.70
Choice of data or Measurement methods and procedures	IPCC value is taken as the country specific value is not available
Purpose of data	To Calculate the baseline emission
Additional comment	-

Data/parameter	TAM _{LT}
Unit	kg
Description	Default values for live weights for animal categories
Source of data	IPCC Default Value Default values from table 10A.5 (new) of chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2019 IPCC Guidelines for National Greenhouse Gas Inventories ¹²
Value(s) applied	Dairy Cow: 260 Market Swine: 49

¹¹ Table 13.A(New) https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

¹² Table 10A.5 (New) https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

Choice of data or Measurement methods and procedures	IPCC value is taken for calculation as the country specific value is not available.
Purpose of data	To Calculate the baseline emission
Additional comment	-

BGTA 11

Data/parameter	$B_{0,L,T}$
Unit	m3 CH4/kg-dm
Description	Maximum methane production potential of the volatile solid generated for animal type LT.
Source of data	IPCC Default Value Default values from table 10.16 of chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2019 IPCC Guidelines for National Greenhouse Gas Inventories ¹³
Value(s) applied	Dairy Cow: 0.13 Market Swine: 0.29
Choice of data or Measurement methods and procedures	IPCC value is taken as the country specific value is not available
Purpose of data	To Calculate the baseline emission
Additional comment	-

¹³ Table 10.16.A https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

BGTA 12

Data/parameter	$MCF_{j,k}$
Unit	%
Description	Annual methane conversion factor (MCF) for the baseline animal manure management system by climate region k.
Source of data	IPCC Default Value Default values from table 10.17 of chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and

	other Land use' of the 2019 IPCC Guidelines for National Greenhouse Gas Inventories ¹⁴											
Value(s) applied	<table><tr><td>Parameter</td><td>dairy_cow</td><td>Market_Swine</td></tr><tr><td>MCF, liquid/slurry/Pit-storage</td><td>62.0%</td><td>62.0%</td></tr><tr><td>MCF,daily spread</td><td>1.0%</td><td>1.0%</td></tr></table>	Parameter	dairy_cow	Market_Swine	MCF, liquid/slurry/Pit-storage	62.0%	62.0%	MCF,daily spread	1.0%	1.0%		
Parameter	dairy_cow	Market_Swine										
MCF, liquid/slurry/Pit-storage	62.0%	62.0%										
MCF,daily spread	1.0%	1.0%										
Choice of data or Measurement methods and procedures	IPCC value is taken as the country specific value is not available. Kenya falls under Tropical dry region. As per the baseline survey, the average time the dung stored in pit is 3.3 month and hence the value applicable for 3 month is considered from IPCC.											
Purpose of data	To Calculate the baseline emission											
Additional comment	-											

BGTA 13

Data/parameter	EF_{b,i,CO_2}
Unit	tCO ₂ /TJ
Description	CO ₂ emission factor arising from use of fuels in baseline scenario
Source of data	IPCC Default Value Default values ¹⁵
Value(s) applied	Wood – 112 tCO ₂ /TJ Charcoal – 165.22 tCO ₂ /TJ LPG – 63 tCO ₂ /TJ
Choice of data or Measurement methods and procedures	IPCC value is taken as per the methodological requirement

¹⁴ Table 10.17 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_10_Ch10_Livestock.pdf

¹⁵ Section 2.3.2 https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_2_Ch02_Stationary_Combustion.pdf

Purpose of data	To Calculate the baseline emission
Additional comment	-

BGTA 14

Data/parameter	$EF_{b,i,non-CO2}$
Unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor arising from use of fuels in baseline scenario
Source of data	Default Value from Methodology
Value(s) applied	Wood – 9.46 tCO ₂ /TJ Charcoal – 44.83 tCO ₂ /TJ LPG – 0.17 tCO ₂ /TJ
Choice of data or Measurement methods and procedures	IPCC value is taken as per the methodological requirement
Purpose of data	To Calculate the baseline emission
Additional comment	-

BGTA 15

Data/parameter	$EF_{p,i,CO2}$
Unit	tCO ₂ /TJ
Description	CO ₂ emission factor arising from use of fuels in project scenario

Source of data	IPCC Default Value Default values ¹⁶
Value(s) applied	Wood – 112 tCO ₂ /TJ Charcoal – 165.22 tCO ₂ /TJ LPG – 63 tCO ₂ /TJ
Choice of data or Measurement methods and procedures	IPCC value is taken as per the methodological requirement
Purpose of data	To Calculate the project emission
Additional comment	-

BGTA 16

Data/parameter	$EF_{p,i,non-CO2}$
Unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor arising from use of fuels in project scenario
Source of data	Default Value from Methodology
Value(s) applied	Wood – 9.46 tCO ₂ /TJ Charcoal – 44.83 tCO ₂ /TJ LPG – 0.17 tCO ₂ /TJ
Choice of data or Measurement methods and procedures	IPCC value is taken as per the methodological requirement
Purpose of data	To Calculate the project emission

¹⁶ Section 2.3.2 https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_2_Ch02_Stationary_Combustion.pdf

Additional comment	-
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BGTA 17

Data/parameter	$NCV_{b,i}$
Unit	TJ/ton
Description	Net calorific value of the fuels used in the baseline
Source of data	IPCC Default Value Default values ¹⁷
Value(s) applied	Wood – 0.0156 TJ/ton Charcoal – 0.0295 TJ/ton LPG – 0.0473 TJ/ton
Choice of data or Measurement methods and procedures	IPCC value is taken as per the methodological requirement
Purpose of data	To Calculate the baseline emission
Additional comment	-

BGTA 18

Data/parameter	$NCV_{p,i}$
Unit	TJ/ton
Description	Net calorific value of the fuels used in the project
Source of data	IPCC Default Value Default values ¹⁸

¹⁷ Table 1.2 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

¹⁸ Table 1.2 [13 Table 1.2 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf](https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)

Value(s) applied	Wood – 0.0156 TJ/ton Charcoal – 0.0295 TJ/ton LPG – 0.0473 TJ/ton
Choice of data or Measurement methods and procedures	IPCC value is taken as per the methodological requirement
Purpose of data	To Calculate the project emission
Additional comment	-

BGTA 20

Data/parameter	$P_{b,i,y}$											
Unit	tonnes/household/year											
Description	Average yearly consumption of baseline fuel i per household before the start of the project activity or at the renewal of each crediting period, whichever is later											
Source of data	Kitchen Performance Test & Baseline survey											
Value(s) applied	<table><tr><td>Primary fuel</td><td>Fuel Wood</td><td>Charcoal</td><td>LPG</td></tr><tr><td>Amount</td><td>3.09</td><td>0.89</td><td>0.02</td></tr></table>				Primary fuel	Fuel Wood	Charcoal	LPG	Amount	3.09	0.89	0.02
Primary fuel	Fuel Wood	Charcoal	LPG									
Amount	3.09	0.89	0.02									
Choice of data or Measurement methods and procedures	The fuel wood consumption & charcoal consumption are determined through KPT and the LPG consumption is determined through baseline survey. The sample size has been calculated with 90/30 confidence/precision level considering the expected mean & standard deviation from the data derived from baseline survey. As per the sample size calculation the minimum sample size required is 5. However, we have conducted 41 households (32 households using fuel wood and 9 household using charcoal). The KPT results achieve required precision level of 30%. Please refer the ER calculation sheet.											
Purpose of data	To Calculate the baseline emission											

Additional comment	As per KPT, the fuel wood consumption per capita is 0.706 t/year which is lesser than Threshold value of 0.75 t/year. The value is also on par with the UNFCCC standardize baseline 'Baseline woody biomass consumption for household cookstoves in Kenya' v1 (Expired on 26th Feb 2020). As per KPT, the charcoal consumption per capita is 0.21 t/year which is in line with Threshold value of 0.195 t/year. The value is also on par with the UNFCCC standardized baseline 'Baseline woody biomass consumption for household cookstoves in Kenya' v1 (Expired on 26th Feb 2020).
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BGTA 21

Data/parameter	$f_{NRB,i,y}$
Unit	percentage
Description	Fractional non-renewability status of woody biomass fuel during year y , in case the baseline fuel is biomass or charcoal.
Source of data	Calculated from various data. Please refer ER sheet
Value(s) applied	0.8249
Choice of data or Measurement methods and procedures	Determined by following the CDM TOOL30, Calculation of the fraction of non-renewable biomass.
Purpose of data	To Calculate the baseline emission & Project Emission
Additional comment	Determined ex-ante and fixed for a given crediting period

B.1.5. Ex ante estimation of SDG Impact

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SDG	Estimated Impact
SDG 1	100% project household will be provided with biogas stoves. No calculation is involved.
SDG 2	50,000 households will be using the digested slurry as fertilizer. No calculation is involved
SDG 3	No project population will be using polluting fuels such as fuel wood or charcoal. It is reduction of 87.5% reduction from baseline scenario. No calculation is involved.
SDG 5	About 3.55 hours/day will be saved from cooking and fuel wood collection. As per baseline survey about 6.05 hours per day is used for cooking and fuel wood collection which is expected to be reduced to 2.50 hours. The time saving is calculated as difference between baseline value and project value.
SDG 7	Clean cooking devices i.e., biodigester & stoves installed at 50,000 rural households. No calculation is involved.
SDG 8	Minimum 60 job creation
SDG 13	Annual average emission reduction of 301,226tCO ₂ e /year. Refer the calculation below the table
SDG 15	Avoidance of 2.17 tonnes of non-renewable biomass/household/year or 108,739 tonnes per year for 50000 households. Refer the calculation in ER calculation sheet.

Estimation of emission reduction (SDG 13)

Summary of Emission reduction

Baseline emission from thermal application

Parameter	Unit	Firewood	Charcoal	LPG	Source
Pb,y	Tonnes/day	0.0085	0.0024	0.0000 548	Baseline survey
NCVb,fuel	TJ/tonne	0.0156	0.0295	0.0473	IPCC
EFb,f,CO2	tCO2/TJ	112	165.22	63	IPCC-VOL-1-CH-1

EF _{b,f,non-CO2}	tCO ₂ /TJ	9.46	44.83	0.17	IPCC-VOL-1-CH-2
N _{p,y}	day	365	365	365	Assumption
U _{p,y}	Percentage	90%	90%	90%	Assumption
f _{NRB,, y}	-	0.8249	0.8249		CALCULATED
SE _{b,y,CO2}	tCO ₂ /technology*day	0.015	0.012	0.000	Calculated as per IPCC default value
SE _{b,y,nonCO2}	tCO ₂ /technology*day	0.001	0.003	0.000	Calculated as per IPCC default value
BE _{b,y}	tCO ₂ e/yr	4.417	4.296	0.054	Ciculated
Ratio		84.4%	3.6%		
BE _{b,y} (Total)	tCO ₂ e/yr	3.92			

Baseline emission from manure management system

Parameter	Unit	dairy_cow	Market_Swine		Source
N _{b,p,y}	day	365	365		Assumptions
UF _b	%	0.94	0.94		Methodology
U _{p,y}	%	90%	90%		Assumptions
GWPCH ₄	tCO ₂ e/tCH ₄	28	28		https://www.goldstandard.org/project-developers/standard-documents
DCH ₄	t/m ³	0.00067	0.00067		Methodology
BO _{LT}	m ³ CH ₄ /kg-dm	0.13	0.29		2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.16A)
MCFBL,liquid/slurry/Pit-storage	%	62%	62%		2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.17)
MCFBL,Daily Sprad	%	1%	1%		2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.17)
MS(T,k), liquid/slurry/Pit-storage	%	99.11%	99.11%		Baseline Survey
MS(T,k), Daily Spread	%	0.89%	0.89%		Baseline survey
NLT _y	Nos	5.12108	0.56889		Baseline Survey
VSrate,LT KG VS	KG VS (1000 KG ANIMAL MASS)-1 DAY-1	15.2000	8.7000		https://www.ipcc-nggip.iges.or.jp/public/2019livestock.pdf
TAMLT (kg)	kg	260	49		

ndy (year)	year	365	365		Assumption
VSLT,y	kg-dm/animal/day	1442.48	155.5995		Calculated
BEAWMS,y	tCO2e/yr	9.36687	0.25039		Calculated
Total	tCO2e/yr	9.62			

Project emission from thermal application

Parameter	Unit	Firewood	Charcoal	LPG	Source
$P_{p,i,y}$	Tonnes/day	0.0004	0.0001	0.0000	Assumption (5% of baseline consumption)
$NCV_{p,i,fuel}$	TJ/tonne	0.0156	0.0295	0.0473	IPCC
$EF_{p,i,fuel,CO2}$	tCO2/TJ	112	165.22	63	IPCC-VOL-1-CH-1
$EF_{p,i,fuel,non-CO2}$	tCO2/TJ	9.46	44.83	0.17	IPCC-VOL-1-CH-2
$Nb_{p,y}$	day	365	365	365	Assumption
Up,y	Percentage	90%	90%	90%	Assumption
$f_{NRB,,y}$	-	0.8249	0.8249		CALCULATED
$SE_{p,y,CO2}$	tCO2/technology*day	0.001	0.001	0.000	Calculated as per IPCC default value
$SE_{p,y,nonCO2}$	tCO2/technology*day	0.000	0.000	0.000	Calculated as per IPCC default value
PE_y	tCO2e/yr	0.221	0.215	0.003	Calculated
PE_y (Total)	tCO2e/yr	0.438			

Project emission physical leakage

Parameter	Unit	Dairy_cow	Market Swine		Source
$Nb_{p,y}$	day	365	365		Assumption
Up,y	%	90%	90%		Assumption
GWpch 4	tCO2e/tCH4	28	28		IPCC
DCH4	t/m3	0.00067	0.00067		Methodology

BoLT,y	m3 CH4/kg VS	0.13	0.29		2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.16A)
NLT,y	Nos	5.12	0.57		Baseline Survey
VSLT,y	kg dry matter/head/year	1442.5	155.6		0
MS%,i,y	%	70%	70%		It is assumed that only 70% of dung is treated in the digester. Remining dung are treated in the baseline manure manageme nt system.
PEawms,h	tCO2e/yr	1.1350	0.0303		Calculated
PEawms,h (total)	tCO2e/yr	1.165			

In addition, the project emission from amount of dung that is not treated in the biogas units are calculated as below (assuming 30% dung is still treated in the baseline treatment system):

Project emission from manure management system

Parameter	Unit	Dairy_cow	Market_Swine	Source
Nb,p,y	day	365	365	Assumptions
UFb	%	0.94	0.94	Methodology
Up,y	%	90%	90%	Assumptions
GWpch ₄	tCO ₂ e/tCH ₄	28	28	https://www.goldstandard.org/project-developers/standard-documents
DCH ₄	t/m ³	0.00067	0.00067	Methodology

BO,LT	m3 CH4/kg-dm	0.13	0.29	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.16A)
MCFBL,liquid/slurry/Pit-storage	%	62%	62%	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.17)
MCFBL,Daily Sprad	%	1%	1%	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories 1 (Table 10.17)
MS(T,k), liquid/slurry/Pit-storage	%	29.73%	29.73%	Assumptions
MS(T,k), Daily Spread	%	0.27%	0.27%	Assumptions
NLT,y	Nos	5.121	0.569	Baseline Survey
VSrate,LT KG VS	KG VS (1000 KG ANIMAL MASS)-1 DAY-1	15.2000	8.7000	https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf
TAMLT (kg)	kg	260	49	
ndy (year)	days	365	365	Calculated
VS LT,y	kg-dm/animal/day	1442.48	155.5995	Calculated
PE AWMS,y	tCO2e/yr	2.81006	0.07512	
Total	tCO2e/yr	2.885		Calculated

Leakage:

The leakage is considered as zero for the ex-ante calculation and the justification is given below:

Leakage Source	Justification
(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.	The baseline technology is traditional three stone cook stove or mud stove. These do not have any economic value as these can be made easily with local materials. Hence, there is no way the baseline stoves are shifted and reused outside the project boundary. Hence, this leakage is considered as zero.
(b) Non-project users who previously used lower emitting energy sources use the non-renewable biomass or	The baseline survey was carried out for non-project users. And the data obtained shows that the target

fossil fuels saved under the project activity.	population are highly dependent on non-renewable biomass or fossil fuels for cooking. Therefore, the risk is highly low because they do not use any other lower emitting energy sources.
(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.	There are 122 GS projects registered in Kenya. However, the impact of change in NRB due to this project (ie, 76,700) does not have any considerable impact of fNRB of other project , therefore the risk is low.
(d) The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.	The project activity is implemented in project areas where the target population does not use fuels for space heating.
(e) By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.	The biogas technology leads to lower emissions compared to the fuels in the baseline scenario, therefore, this risk is not applicable to the project activity

Hence leakage is considered as zero.

Total ER

Details	Thermal Application	Manure Management	Total
Baseline Emission (tCO ₂ /hh/yr)	3.92	9.62	13.53
Project Emission (tCO ₂ /hh/yr)	0.44	4.05	4.49
Leakage	0	0	0
Total Emission Reduction (tCO ₂ /hh/yr)	3.48	5.57	9.05

The total emission reduction estimated based on the below implementation schedule:

B.1.6. Summary of ex ante estimates of each SDG outcome

Year	Baseline estimate	Project estimate	Net benefit
Year 1	20,302	6,733	13,569
Year 2	203,020	67,332	135,687
Year 3	676,732	224,441	452,291
Year 4	676,732	224,441	452,291
Year 5	676,732	224,441	452,291
Total	2,253,518	759,453	1,506,129
Total number of crediting years	5		
Annual average over the crediting period	450,704	149,477	301,226

SDG 1: Proportion of population living in households with access to basic services

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	100%	100%
Year 2	0	100%	100%
Year 3	0	100%	100%
Year 4	0	100%	100%
Year 5	0	100%	100%
Total	NA	NA	NA
Total number of crediting years	5		
Annual average over the crediting period	0	100%	100%

SDG 2: Zero Hunger

Number of farmers adopted practices promoted by the project

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	1500	1500
Year 2	0	15000	15000
Year 3	0	50000	50000
Year 4	0	50000	50000
Year 5	0	50000	50000
Total	NA	NA	NA
Total number of crediting years	5		
Annual average over the crediting period	0	33,300	33,300

SDG 3: Percentage of project population using polluting fuels (reduction)

Year	Baseline estimate	Project estimate	Net benefit
Year 1	87.5%	0%	87.5%
Year 2	87.5%	0%	87.5%
Year 2	87.5%	0%	87.5%
Year 4	87.5%	0%	87.5%
Year 5	87.5%	0%	87.5%
Total	NA	NA	NA
Total number of crediting years	5		
Annual average over the crediting period	87.5%	0%	87.5%

SDG 5: Gender Equality

Number of households saving time for firewood collection and cooking

Year	Baseline estimate	Project estimate	Net benefit
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Year 1	6.05	2.50	3.55
Year 2	6.05	2.50	3.55
Year 2	6.05	2.50	3.55
Year 4	6.05	2.50	3.55
Year 5	6.05	2.50	3.55
Total	NA	NA	NA
Total number of crediting years	5		
Annual average over the crediting period	6.05	2.50	3.5

SDG 7: Number of beneficiaries: Households

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	1500	15000
Year 2	0	15000	15000
Year 2	0	50000	50000
Year 4	0	50000	50000
Year 5	0	50000	50000
Total	NA	NA	NA
Total number of crediting years	5		
Annual average over the crediting period	0	33,300	33,300

SDG 8: Total Number of Jobs

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	60	60
Year 2	0	60	60
Year 3	0	60	60
Year 4	0	60	60

Year 5	0	60	60
Total	NA	NA	NA
Total number of crediting years	5		
Annual average over the crediting period	0	60	60

SDG 15: Total non-renewable wood fuel saved(t/yr)

Year	Baseline estimate	Project estimate	Net benefit
Year 1	0	3,262	3,262
Year 2	0	32,622	32,622
Year 2	0	108,739	108,739
Year 4	0	108,739	108,739
Year 5	0	108,739	108,739
Total	0	362,102	362,102
Total number of crediting years	5		
Annual average over the crediting period	0	72,420	72,420

Monitoring plan

B.1.7. Data and parameters to be monitored

SDG 13

BGTA 24

Data / Parameter	Avoidance of double counting or double claiming among project technology end users
Unit	NA

Description	Evidence of avoidance of double counting or double claiming with project technology end users
Source of data	Each biogas unit constructed will be given a unique identification number so that they can be easily identified during the monitoring surveys and to avoid double counting of the total installed units.
Value(s) applied	No double counting
Measurement procedures (if applicable)	-
Monitoring frequency	Monitored whenever project technology is sold or otherwise disseminated.
QA/QC procedures	Cross check using general internet search and search of public records of Gold Standard and other voluntary market and UNFCCC mechanisms.
Purpose of data	To confirm no double counting.
Additional comment	-

BGTA 25

Data / Parameter	Up,y
Unit	Percentage
Description	Average usage rate in project scenario p during year y
Source of data	Users survey.
Value(s) applied	90%
Measurement procedures (if applicable)	Monitoring of operationality of the biogas systems, including the operationality of both the biogas digester and biogas cookstove, shall be conducted using survey of the users at randomly selected sample sites. The sample shall be selected as per the "Standard for sampling and surveys for CDM project activities and programme of activities" shall be used for determining the sample size to achieve 90/10 confidence/precision levels
Monitoring frequency	Annual

QA/QC procedures	Compliance with the general requirements for sampling (Section 4.4 of methodology) and general requirements for QA/QC (Section 4.5 of methodology)
Purpose of data	To calculate the baseline & project emission.
Additional comment	-

Parameters related to AWMS

BGTA 26

Data / Parameter	NLT,y
Unit	Number
Description	Annual average number of animals of type LT in year y
Source of data	Monitoring Survey
Value(s) applied	Dairy Cow – 5.121 Market Swine- 0.569
Measurement procedures (if applicable)	Monitoring survey as per the sampling plan provided in B.6.2
Monitoring frequency	Annual
QA/QC procedures	-
Purpose of data	To calculate the baseline & project emission.
Additional comment	-

BGTA 31

Data / Parameter	$MS\%i,y$
Unit	%
Description	Fraction of manure handled in project animal manure management system i
Source of data	Survey
Value(s) applied	100%
Measurement procedures (if applicable)	This is determined through sample survey determined from representative sample (90/10 precision).
Monitoring frequency	Annual
QA/QC procedures	-

Purpose of data	To calculate the baseline & project emission.
Additional comment	-

Parameters related to Thermal application

BGTA 38

Data / Parameter	Nb,p,y
Unit	Days
Description	Number of project technology-days included in the project database for each project scenario in year y.
Source of data	Calculated from the Project database as the sum of the number of installed project technology unit's times the calendar days during the year y that they were used at the end user locations.
Value(s) applied	365* no of digesters in operation
Measurement procedures (if applicable)	-
Monitoring frequency	Calculated annually
QA/QC procedures	Cross check the results of the usage survey with the contents of the project database to confirm whether the project technology units surveyed are present at end user locations as expected, or not. If there is discrepancy, this must be explained or corrected.
Purpose of data	To calculate the baseline & project emission.
Additional comment	Applicable for Baseline Emission and Project Emission calculation.

BGTA 39

Data / Parameter	LEp,y
Unit	tCO ₂ e per year
Description	Leakage in project scenario p during year y
Source of data	Sources established by following section 3.7 of methodology, Leakage emissions
Value(s) applied	-

Measurement procedures (if applicable)	-
Monitoring frequency	Every two years, or default discount value of 0.95 applied to emission reductions
QA/QC procedures	Compliance with the general requirements for sampling (Section 4.4 of methodology) and general requirements for QA/QC (Section 4.5 of methodology).
Purpose of data	To calculate the leakage emission.
Additional comment	Monitoring parameters required for calculating leakage emissions shall be included in the monitoring plan in the PDD as required to monitor and quantify the sources of leakage determined by following section 3.7 Leakage emissions.

c. Parameters related to other project emission

BGTA 42

Data / Parameter	Pp,i,y
Unit	tonnes/household/year
Description	Quantity of fuel that is consumed in project scenario p during year y.
Source of data	Project performance field tests
Value(s) applied	0
Measurement procedures (if applicable)	During the monitoring survey the households will be interviewed to know whether the households use other fuel other than biogas for cooking. Then the KPT is conducted at the households who use the other fuels. But the LPG consumption is determined through baseline survey only.
Monitoring frequency	Updated every two years, or more frequently. The KPT values are valid for two years and may be applied for before or after period.
QA/QC procedures	Compliance with the general requirements for sampling (Section 4.4 of methodology), general requirements for QA/QC (Section 4.5 of methodology) and Annex 2: Complementary Guidelines For Kitchen Performance Testing.

Purpose of data	To calculate the project emission.
Additional comment	Applicable for Thermal application method 1

SDG 1

Data / Parameter	Proportion of population living in households with access to basic services
Unit	-
Description	The SDG 1 outcome will be estimated on the total number of beneficiaries, who will have “continuous access” to biogas (renewable energy) for daily cooking. The access to the use biogas for cooking will also ensure that the target beneficiaries have “free” access to basic energy needs for cooking and a sense of ownership of the installed biodigesters. The beneficiaries will also be trained on the proper maintenance of the units during the crediting years. The project beneficiaries are poor and cannot always afford to invest in other fuels for cooking (e.g. LPG), which makes them highly dependent on firewood for cooking. Therefore, in the longer term, the project activity will build the resilience among the project population who are vulnerable climate related and other socio-economic shocks.
Source of data	Monitoring surveys
Value(s) applied	100%
Measurement methods and procedures	The actual values will be based on the data collected during the monitoring surveys.
Monitoring frequency	Annually or more frequently

QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG1.
Additional comment	-

SDG 2

Data / Parameter	Number of farmers adopted practices promoted by the project
Unit	Total number of households
Description	The SDG 3 outcome has been estimated on the total number of beneficiaries, who are making use of the slurry generated from biogas as biofertilizer.
Source of data	Monitoring surveys
Value(s) applied	50000
Measurement methods and procedures	The actual values will be based on the data collected during the monitoring sample surveys. The households will be asked about the reduction in indoor air pollution.
Monitoring frequency	Annually or more frequently
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG2.
Additional comment	

SDG 3

Data / Parameter	Percentage of project population using polluting fuels
Unit	-

Description	The SDG 3 outcome has been estimated on the total number of beneficiaries, who will avoid polluting fuel in cooking. The regular use of biogas will eventually reduce health problems related to indoor air pollution, especially among women who are constantly exposed and inhale harmful smoke while cooking with firewood.
Source of data	Monitoring surveys
Value(s) applied	87.5% (reduction)
Measurement methods and procedures	The actual values will be based on the data collected during the monitoring sample surveys. The households will be asked about the usage of other polluting fuels in cooking such as fuel wood & charcoal.
Monitoring frequency	Annually or more frequently
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG3.
Additional comment	As per WHO, about 3.8 million people a year die prematurely from illness attributable to the household air pollution caused by the inefficient use of solid fuels and kerosene for cooking ¹⁹ . By providing biogas systems for cooking needs the project avoids the indoor air pollution and thereby avoiding the related mortality

SDG 5

Data / Parameter	Average time saving associated with cooking time and fuel collection
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¹⁹<https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>

Unit	Hours
Description	The SDG 5 outcome has been estimated on the total number of beneficiaries, who saved time in collecting firewood and cooking. The total number of women employments generated due to the project activity. .
Source of data	Monitoring surveys
Value(s) applied	3.55 Hours
Measurement methods and procedures	Baseline Survey & Monitoring Survey
Monitoring frequency	Annually or more frequently
QA/QC procedures	
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG5.
Additional comment	

SDG 7

Data / Parameter	Number of beneficiaries: Households
Unit	Total number of households
Description	The SDG 7 outcome has been estimated on the total number of beneficiaries of the project activity, who will have continuous access to biogas. The project activity allows each household to benefit a free access to renewable and sustainable energy (biogas) for cooking.
Source of data	Project database

Value(s) applied	50000
Measurement methods and procedures	As and when a bio digester is installed the same is recorded in the project database.
Monitoring frequency	Continuous monitoring
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG7.
Additional comment	-

SDG 8

Data / Parameter	Total number of jobs
Unit	No
Description	The SDG 8 outcome has been estimated on the total number of jobs created by the project activity
Source of data	Employment records
Value(s) applied	60
Measurement methods and procedures	The employment records will be maintained by the HomeBiogas.
Monitoring frequency	Continuous monitoring
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG8.
Additional comment	-

SDG 15

Data / Parameter	Total non-renewable wood fuel saved
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Unit	Tonnes/year
Description	The SDG 15 outcome has been estimated based on the quantity of firewood used per day for cooking and heating water, which eventually should decrease compared to the baseline situation without the availability of biogas for cooking. This will reduce the pressure on the forest land in the project area. The use of biogas will reduce the quantity of firewood use by 80-100% in the initial years of the project. In the long term the decrease in firewood demand will eventually reduce the adverse impacts on local forests.
Source of data	Estimation based on the baseline & project survey data
Value(s) applied	108,739
Measurement methods and procedures	The actual values will be based on the data collected during the monitoring surveys and multiplied with non renewable biomass fraction
Monitoring frequency	Annually or more frequently
QA/QC procedures	Transparent data analysis and reporting.
Purpose of data	To monitor the positive contribution of the proposed project related to the SDG15.
Additional comment	-

B.1.8. Sampling plan

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The sampling approach, used to determine all the parameters mentioned in section B.7.1, is as per the guidelines provided in the applied GS methodology²⁰. The monitoring surveys will be carried out in the project scenario using representative and random sampling. The following parameters will be determined through annual sample survey:

- Average usage rate in project scenario p during year y
- Annual average number of animals of type *LT* in year y
- Fraction of manure handled in project animal manure management system
- Proportion of population living in households with access to basic services
- Percentage of project population using polluting fuels
- Average time saving associated with cooking time and fuel collection
- Number of farmers adopted practices promoted by the project

The required minimum sample methodology guidelines for minimum sample size:

- o Group size <300: Minimum sample size 30 or population size, whichever is smaller
- o Group size 300 to 1000: Minimum sample size 10% of group size
- o Group size > 1000 Minimum sample size 100

Therefore, for the total biogas units installed in the project activity, a minimum sample size of 100 will be randomly selected to collect the required monitoring data.

The following parameter will be determined through field test/Survey:

- Quantity of fuel that is consumed in project scenario p during year y.

For the project field test, the sample size will be determined any one of the following options;

²⁰Technologies and Practices to Displace Decentralized Thermal Energy Consumption (Version 3.1), July 2015 – page 31 & page 12.

- 90/30 rule. When the sample sizes are large enough to satisfy the “90/30 rule,” i.e. the endpoints of the 90% confidence interval lie within +/- 30% of the estimated mean, overall emission reductions can be calculated on the basis of the estimated MEAN annual emission reduction per unit or MEAN fuel annual savings per unit.
- 90% confidence rule. When the sample sizes are such that the “90/30 rule” is not complied with, the emission or fuel saving result is not the mean (or average) test result, but a lower value, i.e. the LOWER BOUND of the one-sided 90% confidence interval.

However, in any cases CME shall ensure the sample size of FT is greater than 30.

B.1.9. Other elements of monitoring plan

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The monitoring data collected is specific to the characteristics of the project scenario, and the following information will be collected during each monitoring survey:

- User follow up
 - Address or location
 - Mobile telephone number and/or landline telephone number (if possible)
- End user characteristics
 - Number of people served by the biogas technology
 - Number of biogas hours used per day per household
 - Number of animals (per category) per household
 - Amount of dung collected from the shed etc.
- Biogas and other fuels used for cooking
 - Types of project technologies used and estimated frequency
 - Types of fuels used and quantities
 - Seasonal variations
 - Sources of fuels other than biogas; (purchased or hand-collected, etc.) and prices paid or effort made (e.g. walking distances, persons collecting, opportunity cost)
- SDG's impact
 - If had any technical problems with the biodigester (cracks) pipe damaged, stove damaged etc.)
 - If received training by the project supervisors on the maintenance of the unit
 - Use of the biogas slurry
 - Reduction in the use of firewood for cooking and heating water

Data Management:

The complete project data including the digester installation database, baseline data, monitoring data, repair & maintenance data etc., will be recorded in a CRM database of CME. The field staff will update the project data in this excel sheet from the field itself.

as and when the data is collected. To ensure the accuracy of the data the coordinators regularly cross-verify the data collected by the field staff.

SECTION C. DURATION AND CREDITING PERIOD

Duration of project

C.1.1. Start date of VPA

>> 01/02/2022

C.1.2. Expected operational lifetime of VPA

>> 15 years

Crediting period of project

C.1.3. Start date of crediting period

>> 01/03/2022

C.1.4. Total length of crediting period

>> 5 years (01/03/2022 to 28/02/2027)

SECTION D. SUMMARY OF SAFEGUARDING PRINCIPLES AND GENDER SENSITIVE ASSESSMENT

Safeguarding Principles that will be monitored

A completed Safeguarding Principles Assessment is in [Appendix 1](#), ongoing monitoring is summarized below.

Principles	Mitigation Measures added to the Monitoring Plan
NA	

Assessment that project complies with GS4GG Gender Sensitive requirements

Question 1 - Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy?	The project addresses the key issues and requirements of Gender Sensitive design and implementation to address the hardships of women. The foundational gender-sensitive standards were addressed as follows: - The gender equality safeguards and principles are described in Appendix 1. - The gender inequalities and gender-related risks have been addressed by making women as beneficiaries of biogas. - Women and men participated equitably and meaningfully in the project design and implementation. During construction, man of the house assisted the masons in construction. Women provided
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	food during the construction. The project benefits are experienced by men and women. The project was implemented for the marginalized families and there is no discrimination of caste, creed or religion for selection of families.
Question 2 - Explain how the project aligns with existing country policies, strategies and best practices	Strategies and best practices, as gender policy is institutionalized by the VPA implementer and CME, it addresses all the gender policies as set forth in the GS4GG and Kenya national policy on gender and development ²¹, which are as follows. - The project provides positive economic and social incentives for full development of women. - It reduces the hardship of women in cooking, cleaning and collecting fuel wood. - There is not hindrance to human rights and fundamental freedom by women on equal basis with men. There is equal access to participation and decision making of women in the project.
Question 3 - Is an Expert required for the Gender Safeguarding Principles & Requirements?	The Gender Requirements are adequately addressed in safeguarding

²¹<https://gender.go.ke/wp-content/uploads/2019/10/NATIONAL-POLICY-ON-GENDER-AND-DEVELOPMENT.pdf>

	principles assessment provided in Appendix 1. No expert is required.
Question 4 - Is an Expert required to assist with Gender issues at the Stakeholder Consultation?	The Gender Requirements is addressed in safeguarding principles assessment provided in Appendix 1. The stakeholder consultations do not present any particular challenges from a Gender perspective. No expert is required.

SECTION E. SUMMARY OF LOCAL STAKEHOLDER CONSULTATION

Below is a summary of the 2 steps GS4GG Consultation for monitoring purposes.

Please refer to the separate Stakeholder Consultation Report for a complete report on the initial consultation and stakeholder feedback round.

Summary of stakeholder mitigation measures

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The local stakeholders' consultation was conducted at PoA level. Hence not applicable.

Final continuous input / grievance mechanism

Method	Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers.
Continuous Input / Grievance Expression Process Book (mandatory)	Continuous Input /Grievance Expression Process Book will be kept at Reindeer office Ting'ang'a, Kiambu - Githunguri Road, Nairobi P.O. Box 75362 Region Westlands District. This will be most appropriate as the address provided is accessible to all the stakeholders and the grievance forms received will be reviewed monthly and grievances (if any) will be addressed accordingly.
GS Contact (mandatory)	help@goldstandard.org Phone: +41 (0) 22 788 7080
Telephone access	CME Representatives: Phone Number 0797-878-909
Internet/email access	kenyaoffice@homebiogas.com

SECTION F. Eligibility and inclusion criteria for VPAs inclusion

>>

No.	Eligibility Criterion	Description/ Required condition	Description of the VPA in relation to the criteria, means of Verification/Supporting evidence for inclusion
1	Geographical boundaries of the VPA consistent with that of the PoA	The PoA boundary corresponds to the boundaries of Kenya. Each VPA will be located within Kenya.	The project will be installed in Kenya. Hence, the VPA boundary is consistent with the geographical boundary set in the PoA Evidence: VPA-DD, section A.4 specifies location and boundary of the VPA.
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals, such as unique identifications of product and end user locations	A unique numbering system for devices (bio-digester) will be applied in each VPA, assigning a unique number to each device and allowing to clearly identify for each device to which VPA it belongs. Also, all end users address will be recorded and maintained in the CRM database of each VPA.	Each biogas unit installed in the project will come with a unique id/number on it. The same id/number will be recorded in the project database. Also, location of each biogas system including latitude and longitude, End user address will be recorded in the CRM database. Thus, double counting shall be avoided.
3	Conditions to check the start dates of VPA through documentary evidence	The construction start date of first digesters in the VPA shall be considered as start date of the respective VPA.	As per project database, 01/02/2022 is the construction start date of the 1 st digester mentioned in the project database. This is matching with start date mentioned in VPA-DD. Evidence: Project database has been updated with construction start date of all digesters.
4	Conditions to ensure compliance with the applicability of the applied	The livestock population in the farm is managed fully or	The livestock are managed entirely in a confined conditioned. The cattle are kept in shed for 24 hours.

methodologies, the applied standardized baselines and the other applied methodological regulatory documents	partly under confined conditions;	Evidence: Baseline survey results.
	Manure or the streams obtained after treatment are not discharged into natural water resources (e.g., river or estuaries);	Manure is not discharged in the natural water-bodies instead converted in to liquid bio-fertilizers and used for land application and the same will be monitored during ex-post. Evidence: The slurry application is included as monitoring plan in section B.7 of VPA-DD.
	The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;	The annual average temperature in Kenya is 25°C degrees Celsius which is higher than 5°C.
	In the baseline scenario, the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m;	The average retention time of manure in pit/heap in the baseline condition is 3.34 month and the depths are 1 m or more. Evidence: Baseline survey results.
	The baseline scenario should not involve methane recovery and destruction by flaring or combustion for gainful use.	There is no methane recovery in the baseline as the cattle dung is directly dumped in open pits. Evidence: Baseline survey results.
	The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project developer can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	The manure is available from the cattle shed which is near to the house and the manure removal from the cattle shed and fed into digester on daily basis and hence there is no transportation and storage of feedstock involved. Evidence: Baseline survey results.

	A technical measure to ensure that the gas holding capacity of the biodigester is sufficiently large to capture the biogas during periods of non-usage. A justification to demonstrate compliance with this requirement pertaining to the biogas digester size shall be included in the Project Design Documentation (PDD).	The biogas is used daily for the household cooking. There are no non-usage days involved. Hence this condition is not applicable.
	The activity is implemented by a project developer and can include additional project participants listed in Appendix 2 of the PDD template. The individual households may be represented collectively by community organisations, etc., but do not individually act as project participants	The CME is the project developer and no additional participants are involved. The contact details of CME are included in Appendix 2 of the PDD Evidence: Appendix 2 of PDD.
	The developer must design incentive mechanism(s), which should be effective as fast as possible, for the displacing the use of inefficient baseline stoves or cooking practices by the project cooking devices for daily usage and describe the incentive mechanism(s) in the PDD/VPA-DD at the time of validation.	The baseline technology (3 stones stove or mud stove for firewood use) in the project activity will be replaced by the use of biogas for daily cooking. The biogas gas is a clean cooking technology which results in reduction in some, reduction in cooking time, fuel wood collection time & utensils cleaning time. This itself act as encouraging factor to use biogas system. Additionally, to encourage the complete removal of old technology, the biodigesters are given to the beneficiary at subsidized cost. Also, to assure the continuous use of the biogas, beneficiaries will be trained in maintenance of the system. Also, CME will do annual survey to check the usage of old technology and deduct the same from the emission reduction.

	To avoid double counting or double claiming, the project developer must: a. clearly communicates its ownership rights and intention of claiming the emission reductions resulting from the project activity to the following parties by contract or clear written assertions in the transaction paperwork: all other project participants; project technology manufacturers; and retailers of the project technology; and b. informs and notify the end users that they cannot claim emission reductions from the project, and c. excludes from the project activity, any biodigester and cookstoves that are included in any other voluntary market or CDM or Article 6 based mechanisms project activity/PoA and strive not to displace the cooking devices of another CDM or voluntary project/PoA. See data and parameters not monitored (section 3.11), Avoidance of double counting or double claiming with other mitigation actions (BGTA 2), for details on this demonstration.	a. An end-user agreement has been signed with the beneficiary explaining in local language the ownership rights of the emission reductions resulting from the project. Evidence: End user agreement. b. The end users have been notified about the emission reduction rights during the stakeholder meeting. Evidence: LSC report c. The VPA, nor any of its devices is not yet registered and not being registered as a standalone CDM project by ensuring that the VPAs has the full title over the emission reductions generated by the users listed in the VPA. d. Evidence: Declaration on double counting
5	Conditions to ensure that VPAs per the section 3.3 of meet the requirements for applied methodology, the demonstration of additionality following condition shall be fulfilled: The VPA with biodigester technology should confirm the VPA solely composed of isolated units where the users of the technology/measure are households or communities or institutions and where	The biogas system are isolated units and the end users of the biogas system are households and each biodigester in the project will result in emission reduction of 9.05 tCO₂e which is less than 600 tCO₂e. Evidence: ER calculation sheet

		each unit results in ≤ 600 tonnes of emission reductions per year.²² (Community services activity requirements V-1.2 –Annex B - Positive list para 1.1.3) OR The additionality shall be proved as per most recent version of the UNFCCC additionality tools or any approved GS VER additionality tool.	
6	Describe the technologies/measures to be employed and/or implemented by the real case VPAs and its regular VPAs, including a description of their common features	VPAs under this PoA will consist in the distribution of bio-digester to users cooking/heating water with non-renewable biomass in the baseline scenario. The bio-digester will have a capacity of 2.5 m³ biogas generation per day.	The project involves distribution of bio-digesters to the users using the non-renewable biomass in the baseline. The biodigester to be distributed in the project activity will have capacity of 2.5 m³ biogas generation per day. Evidence: The Section B.4 of VPA-DD confirms baseline scenario and section A.5 of the VPA DD specifics the type(s) bio-digester, capacity of digester including, among others, a description whether devices are fixed or portable and a specification of the capacity and approximated dimensions.
7	Specification of the technology/measure, such as the level and type of service, as well as performance specification based on, inter alia, testing/certification;	VPAs under this PoA will consist in the distribution of bio-digester to users cooking/heating water with non-renewable biomass in the baseline scenario.	The project involves distribution of bio-digesters to the users using the non-renewable biomass in the baseline. The biodigester to be distributed in the project activity will have capacity of

²² <https://globalgoals.goldstandard.org/201-ar-community-services-activity-requirements/>

		The bio-digester will have a capacity of 2.5 m ³ biogas generation per day.	2.5 m ³ biogas generation per day Evidence: The Section B.4 of VPA-DD confirms baseline scenario and section A.5 of the VPA DD specifics the type(s) bio-digester, capacity of digester including, among others, a description whether devices are fixed or portable and a specification of the capacity and approximated dimensions.
8	The PoA-specific requirements, including any conditions related to undertaking local stakeholder consultation and environmental impact analysis	The local stakeholder consultation is conducted at the PoA level (Section F of the PoA-DD). Each VPA will be implemented in similar social economic situations. The key stakeholders of the program both at PoA and VPA level are the same. An environmental impact analysis is not required (section E.2 of the PoA-DD).	The VPA is implemented in the rural households of Kenya which have similar social economic situation as described in the PoA-DD. Hence, the key stakeholders of this VPA and PoA-level are same. Evidence. Section E of VPA-DD Also, as per the PoA-DD the environmental analysis is not required for this VPA.
9	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance	The CME and the VPA operator (in case of being different from the CME) shall confirm that in case of public funding, there is no diversion of Official Development Assistance.	The project will be completely funded by HomeBiogas. No ODA fund is involved in the project. Evidence: ODA Declaration.
10	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/offgrid), and where applicable, distribution mechanisms (e.g. direct installation)	Target groups are domestic household who use traditional stoves for cooking and/or water heating with non-renewable biomass. The distribution mechanism is the direct distribution of devices (Bio-digester)	The target group of the VPA are the domestic households who use traditional stoves for cooking with non-renewable biomass Evidence: VPA-DD section A.1, describes the target groups. End user agreements template
11	If the generic VPA applies sampling for the determination of parameter	No single sampling plan for all VPAs is proposed. If VPA-DD applies sampling for the	Since the project is GS VER project, the sampling plan is described in Section B.7.2 of

	values for calculating GHG emission reductions or net anthropogenic GHG removals, conditions related to sampling requirements for the PoA in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities"	determination of parameter values for calculating GHG emission reductions or net anthropogenic GHG removals then sampling plan will be provided in each VPA-DD in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities"	the VPA-DD in accordance with the Applied GS methodology 'Methodology for animal manure management and Biogas use for thermal energy generation, version 1.1 and "Standard: Sampling and surveys for CDM project activities and programme of activities"
			Evidence: VPA-DD, section B.7.2
14	Awareness and agreement of those operating a VPA on PoA subscription	Where the VPA operator is different from CME, contractual provisions to ensure that those operating the VPA are aware and have agreed that their activity is being subscribed to the PoA.	Not applicable since there is no separate VPA implementor. The CME implements the project. Evidence: VPA-DD, Section A.1
15	Monitoring plan	The monitoring plan of the VPA included under the PoA shall follow the requirements of applied methodology "Methodology for Animal Manure Management and Use of Biogas for Thermal Energy Generation"	The Monitoring plan of the VPA in line with the methodology 'Methodology for Animal Manure Management and Use of Biogas for Thermal Energy Generation' – V.1.1 & PoA-DD Evidence: Section B.7 of VPA-DD
16	Conditions to be met by each VPA regarding SDG outcomes assessment	The VPA shall confirm SDG contribution to minimum three SDGs out of targeted by the POA (ie, SDG 1, 3, 7, 8, 13 &15). SDG13 shall be considered as mandatory	VPA confirms the contribution to SDG 1, 2, 3, 5, 7, 8, 13 & 15. This also includes the mandatory SDG 13. Evidence: Section B.6 of VPA-DD
17	Conditions to be met for retroactive VPAs	If a retroactive VPA is added to the PoA, the VPA documents shall be submitted to preliminary review within one year of its start date	The project is a regular project. Moreover, the VPA documents are submitted to preliminary review on 10/01/2023 which is within one year from start date of VPA 01/02/2022. Evidence:

	Section C.1.1 of VPA-DD showing start date of the project.
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APPENDIX 1 - SAFEGUARDING PRINCIPLES ASSESSMENT

Complete the Assessment below and copy all Mitigation Measures for each Principle into [SECTION D](#) above. Please refer to the instructions in the [Guide to Completing](#) this Form below.

Assessment Questions/ Requirements	Justification of Relevance (Yes/potentiall y/no)	How Project will achieve Requirements through design, management or risk mitigation.	Mitigation Measures added to the Monitoring Plan (if required)
Principle 1. Human Rights			
1. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights	No	The PoA respects human rights and does not complicit in violence or human rights abuse. The PoA does not discriminate people participation. Secondly, the PoA promotes participation regardless of the sex, religion, age, disability etc.	NA

2. The Project shall not discriminate with regards to participation and inclusion			
Principle 2. Gender Equality			
1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women 2. Projects shall apply the principles of nondiscrimination, equal treatment, and equal pay for equal work 3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks 4. (where required) Summary of opinions and recommendations of an Expert Stakeholder(s)	No	1. The project is implementation of bio digester in rural households for cooking that ease women hardship in cooking, cleaning & fire wood collecting. The Project does not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women. 2. The VPA implementer and CME does not discriminate employee or end user or any stakeholder in any way. The VPA implementer pay equal salary to a work without discrimination of gender. The project has considered the gender roles and therefore had invited both men and women to actively participate in the stakeholder consultation meeting. Moreover, both women and men will be equally considered in the participation	NA

		of the project. Without any discrimination, both will be equally trained on the maintenance and to the use of biogas units for daily cooking needs. 3. Strategies and best practices, as gender policy is institutionalized by the VPA implementer and CME, it addresses all the gender policies as set forth in the GS4GG²³, which are as follows. - The project provides positive economic and social incentives for full development of women - It reduces the hardship of the women in cooking, cleaning and collecting fuel wood.	
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²³<https://wcd.nic.in/womendevlopment/national-policy-women-empowerment>

		- There is not hindrance to human rights and fundamental freedom by women on equal basis with men - There is equal access to participation and decision making of women in the project 4. No expert opinion is required	
Principle 3. Community Health, Safety and Working Conditions			
1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community	No	The use of biogas for cooking will avoid indoor air pollution by providing a clean environment for cooking.	NA
Principle 4.1 Sites of Cultural and Historical Heritage			
Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture?	No	The devices are installed within the household premises. The programme will not be implemented in areas where there are cultural sites or any other historical heritage.	NA
>>			
Principle 4.2 Forced Eviction and Displacement			

Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	No	The biogas units are installed near the beneficiary household premises. Therefore, the PoA does not involve any forced eviction or displacement of the project population.	NA
Principle 4.3 Land Tenure and Other Rights			
a. Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or access rights, usage rights or land ownership? b. For Projects involving land use tenure, are there any uncertainties with regards to land tenure, access rights, usage rights or land ownership?	No	The biodigesters are installed on the beneficiary's land and there is no land tenure. Before construction of the biogas units, the implementation team will ensure there is sufficient place to install the biogas units.	NA
Principle 4.4 - Indigenous people			

Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	Not applicable	NA
>>			
Principle 5. Corruption			
1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	No	The PoA does not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt projects.	NA
Principle 6.1 Labour Rights			
1. The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions 2. Workers shall be able to establish and join labour organisations 3. Working agreements with all individual workers shall be	No	1. The project does not imply any forced labour. Sustainable long, middle and short term jobs will be created. All workers will follow specific trainings on the implementation & repair of the project devices Thus, living conditions of the local population will be improved by job creation, stabilising rural families and generating new income. Kenya ratified ILO conventions C029 -	NA

documented and implemented and include: a) Working hours (must not exceed 48 hours per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (must include provision for payment of overtime), AND d) Modalities on health insurance, AND e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave.		Forced Labour Convention, 1930 and C105 - Abolition of Forced Labour Convention, 1957²⁴. 2. The workers of the PoA are free to establish or join a labor organization. The CME or VPA implanter will not restrict this. 3. Working agreements with all individual workers will be documented and implemented. Signed contracts between CME/VPA implementer and all workers will be established and verified. 4. The project does not promote child labor. Even more, the installation of these units helps	
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²⁴https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11200:0::NO::P11200_COUNTRY_ID:103315

4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion) 5. The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures		reduce the wood collection time for children, allowing them to regularly attend the school. This should increase their education and scholar results. 5. The workers are provided safety equipment's (helmets, boots, gloves etc.) whenever necessary to avoid any accidents at the construction area. Also, all the workers will be trained in the particular technology to avoid any accidents and incidents.	
Principle 6.2 Negative Economic Consequences			
1. Does the project cause negative economic consequences during and after project implementation?	No	Monitoring team will be established to take care of any repair & maintenance of the project devices.	NA

		This will also reduce the fuel wood collection time and cooking time which will lead to generation of other income during the free time. Also, the operation does not involve any cost and hence the project will be self-sustainable even without involvement of CME & implementer after the implementation. And secondly, the use of bio-fertilizer for agriculture will reduce their expenses on chemical fertilizers. Therefore, the project does not have any negative economic consequences.	
Principle 7.1 Emissions			

Will the Project increase greenhouse gas emissions over the Baseline Scenario? >>	No	PoA does not increase emissions over the Baseline Scenario, as it the regular use of biogas stove for daily cooking/water heating will reduce the use of firewood thereby reducing potential CO2 emissions. And the operation of biogas units also reduces the methane emissions that would have occurred if the cattle-dung was left to decay in the traditional compost pits.	NA
Principle 7.2 Energy Supply			

Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users? >>	No	The PoA does not affect the availability and reliability of energy supply to other users. The project device replaces the use of wood-stoves or other fossil-based cooking-stoves, and beneficiaries will be autonomous in energy supply.	NA
Principle 8.1 Impact on Natural Water Patterns/Flows			
Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?	No	The PoA does not have any kind of impact on the natural water patterns/flows.	NA
Principle 8.2 Erosion and/or Water Body Instability			

a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion? b. Is the Project's area of influence susceptible to excessive erosion and/or water body instability?	No	The project is not linked to any other kind of activity other than implementation of the biogas units which might lead to erosion and/or water body instability.	NA
Principle 9.1 Landscape Modification and Soil			
Does the Project involve the use of land and soil for production of crops or other products?	No	No, the project does not involve the use of land and soil for production of crops or other products	NA
Principle 9.2 Vulnerability to Natural Disaster			

Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	No, the project will not be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions.	NA
Principle 9.3 Genetic Resources			
Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development, or take place in facilities or farms that include GMOs in their processes and production)?	No	The project does not link to any activity related to genetic resources.	NA
Principle 9.4 Release of pollutants			
Could the Project potentially result in the release of pollutants to the environment?	No	The PoA will reduce the release of pollutants that might have been caused due to the use of firewood for daily cooking needs of the beneficiaries. Moreover, foul smell of the cow-dung is also reduced leading to an environment	NA

		more hygienic for the beneficiaries in the project area. Indoor and outdoor air quality will thus be improved by the implementation of the project.	
Principle 9.5 Hazardous and Non-hazardous Waste			
Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The PoA does not involve in hazardous material production, trade or release.	NA
Principle 9.6 Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers?	No	The PoA does not involve any application of pesticides and/or fertilisers. The manure put into a biodigester turns into slurry that can be utilized as bio-fertilizer along with other agricultural wastes as an 'organic compost', to partially or fully substitute the use of chemical fertilizers for agriculture.	NA

Principle 9.7 Harvesting of Forests			
Will the Project involve the harvesting of forests?	No	The PoA does not directly relate to forest management, but implementing the PoA will reduce the human pressure on the forest. The wood collection by beneficiaries will be reduced drastically. The CME/VPA implementer will monitor the project annually to make sure that beneficiaries are continuously using the biogas. In the long-term the project will help to restore the forest.	NA
Principle 9.8 Food			
Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	No	The PoA does not modify the quantity or nutritional quality of food available. In fact, the manure put into a bio-digester turns into slurry that can be utilized along with other agricultural wastes as an 'organic compost', to improve the soil fertility and in the long-term increasing the crop yields.	NA
>>			
Principle 9.9 Animal husbandry			
Will the Project involve animal husbandry?	No	The PoA is not linked to any activity related to animal husbandry.	NA
>>			
Principle 9.10 High Conservation Value Areas and Critical Habitats			

Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?	No	The project devices are installed in the premises of the rural household. It does not physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas.	NA
>>			
Principle 9.11 Endangered Species			
a. Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)?	No	Endangered species are not in competition with humans in the project zone and the project does not lead to the reduction or negative impact of any recognized endangered, vulnerable or critically endangered species.	NA
b. Does the Project potentially impact other areas where endangered species may be present through transboundary affects?		Moreover, in the long-term the project will help to restore the forest that can sustain various species of both plant and animals depending on this forest area.	
>>			

APPENDIX 2- CONTACT INFORMATION OF VPA IMPLEMENTER

Organization name	HomeBiogas LTD
Registration number with relevant authority	
Street/P.O. Box	PO Box 1672
Building	-
City	Beit Yanai
State/Region	-
Postcode	40293
Country	Israel
Telephone	-
E-mail	yamit@homebiogas.com
Website	www.homebiogas.com
Contact person	-
Title	Ms
Salutation	Director
Last name	Naftali
Middle name	-
First name	Yamit
Department	Strategy and Business Development
Mobile	-
Direct tel.	-
Personal e-mail	yamit@homebiogas.com

APPENDIX 3- LUF ADDITIONAL INFORMATION

Risk of change to the Project Area during Project Certification Period:	
Risk of change to the Project activities during Project Certification Period:	
Land-use history and current status of Project Area:	
Socio-Economic history:	
Forest management applied (past and future)	
Forest characteristics (including main tree species planted)	
Main social impacts (risks and benefits)	
Main environmental impacts (risks and benefits)	
Financial structure	
Infrastructure (roads/houses etc):	
Water bodies:	
Sites with special significance for indigenous people and local communities - resulting from the Stakeholder Consultation:	
Where indigenous people and local communities are situated:	
Where indigenous people and local communities have legal rights,	

customary rights or sites with special cultural, ecological, economic, religious or spiritual significance:

APPENDIX 4-SUMMARY OF APPROVED DESIGN CHANGES

Please refer to [Design Changes Requirements](#) for more information on procedures governing Design Changes

Revision History

Version	Date	Remarks
2.0	4 May 2022	
1.1	7 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Inclusion criteria table added Gender sensitive requirements added Prior consideration (1 yr rule) and Ongoing Financial Need added Safeguard Principles Assessment as annex and a new section to include applicable safeguards for clarity Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on Stakeholder Consultation information required Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption