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Gold Standard for the Global Goals
Key Project Information & Project Design Document (PDD)

Version 1.1 – August 2017

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KEY PROJECT INFORMATION

Title of Project:	Household and Commercial Biogas Plants in Kenya (GS7587)
Brief description of Project:	The project activity involves installation of biogas plants for households and commercial purposes in Kenya of capacitites ranging between 6m^3-40m^3. These biogas plants allow households, slaughterhouses and small-medium sized farms to transform their organic waste into renewable biogas to accommodate their energy demand and drive regional sustainable development. The purpose of the project is to reduce greenhouse gas emissions by displacing conventionally used non renewable biomass with renewable biogas. In addition, appropriate disposal of waste will lead to improved hygiene conditions in the areas where the project activities are implemented. Further, residue from the biodigesters is used as an organic fertilizer and will further enhance the condition of soil.
Date of Implementation: Expected duration of Project:	07/12/2018 5 years renewable cycle
Project Developer:	Good Farmland Management Kenya, LTD
Project Representative:	Swiss Carbon Value Ltd.
Project Participants and any communities involved:	Good Farmland Management Kenya, LTD, Swiss Carbon Value Ltd.
Version of PDD: Date of Version:	2 18/05/2020
Host Country / Location:	Kenya
Certification Pathway (Project Certification/Impact Statements & Products	Impact Statements & Products
Activity Requirements applied: (mark GS4GG if none relevant)	GS4GG: Community Services Activity Requirements
Methodologies applied:	Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 3.1
Product Requirements applied:	GS VER
Regular/Retroactive:	Retroactive
SDG Impacts:	1– Decent work and economic growth (SDG 8) 2- Affordable and clean Energy (SDG 7) 3-Climate Action (SDG 13)
Estimated amount of SDG Impact Certified	SDG 13: 405,610 tCO_2e/year SDG 8: 250 jobs generated/year SDG 7: 84,226 household access to affordable and clean energy

SECTION A. Description of project

A.1. Purpose and general description of project

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The aim of the project is to provide a wide range of social, economic, and environmental benefits for families and communities in Kenya by installation of Sistema.bio's digesters. These biogas digesters having a varying capacity between 6m^3 to 40m^3 are employed to treat waste, produce renewable energy and organic fertilizer. Each household or commercial unit will utilize the dung of its cattle to feed the digester for the production of biogas for domestic purposes. This leads to reduction of greenhouse gas emissions by displacing conventionally used non-renewable biomass with renewable biogas. Further, residue from the biodigesters is used as organic fertilizer and will improve soil conditions in rural areas. In addition to improved sanitation due to proper disposal of waste, the residure from the biodigesters can also be used as an organic fertilizer to enhace soil produvtivity.

Project activity will also contribute towards sustainable development by replacing firewood with biogas generated from the biodigesters.

Baseline Scenario:

Household survey was conducted to assess the baseline fuel and quantity used. As per the Survey, firewood was the main fuel used to suffice the domestic needs which was sourced from nearby forests and open market. On an average, every house hold used approximately 512 kg of fuelwood and spent around 3209 KES to buy it every month. Usage of inefficient firewood leads to indoor pollution along with decrease in forest land cover and increase in degraded land. Growing pressure from human and livestock population coupled with indiscriminate and illegal exploitation of forest resources are among factors that have lead to further intensification of the problem. The closed canaopy cover of Kenya is much lower when compared to the African average.[1] Prolonged degradation of country's forest land will eventually impact adversely on the productivity of the nation. Hence there is a dire need to maintain adequate forest cover in the country to mitigate the effects of climate change.

Project Scenario:

Project activity involves adoption of biogas digesters by the households and commercial units of Kenya constructed and maintained by Siestema.bio. The produced biogas are used in the biogas stoves for thermal energy needs. Hence, the project activity is a Greenfield project activity.
The residue from the biodigesters is used as an organic fertilizer in the fields.

Project activity will result in saving of 2,028,049 tCO_2e in first crediting period from 07/12/2018 to 06/12/2023 with an average saving of 405,610 tCO_2e/year

The size of the biodigesters varies, depending on the number of people and number of cattle available per household. As on year 2019, a total of 1,126 biogas plants will be installed in various parts of the country. A detailed breakdown of the plants with the respective installed capacity in 2018-19 (07/12/2018 to 31/12/2019) and the proposed biodigesters from 2020 to 2023 is given in table 1 below.

Table 1:Breakdown of the plants with the respective installed capacity

	2018	2019	2020	2021	2022	2023	Total

[1] See: http://www.environment.go.ke/wp-content/uploads/2018/08/Forest-Report.pdf

Total biodigesters installed	**69**	**1057**	**3100**	**10000**	**20000**	**50000**	**84226**
Sistema 6	30	355	837	2100	3000	4500	10822
Sistema 8	20	283	899	3100	6600	17500	28402
Sistema 12	7	186	620	2200	4800	13000	20813
Sistema 16	2	61	186	600	1200	3000	5049
Sistema 20	7	92	372	1300	2800	7500	12071
Sistema 30	1	23	0	0	0	0	24
Sistema 40	2	57	186	700	1600	4500	7045

A.2. Eligibility of the project under Gold Standard

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The project falls under GG4GG Community Services Activity Requirements:

Eligible Project Types & Scope: The projects leads to climate change mitigation by providing access to resources (biogas) to households and commercial institutions. Types of project: The project falls under 'Renewable energy" type-Waste management and handling: Management of animal waste (cattle dung) to deliver biogas, End-Use Energy Efficiency.

Project Area, Boundary and Scale: Project Area and Boundary is described under section A.4 below.

Scale: The project falls under waste handling and disposal, end use energy efficiency with emission reductions 405,610 tCO_2e per year with the total installed energy output of 690.27 $MW_{thermal}$. Hence, the project falls under large scale projects.

A.3. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

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Implementation of the proposed project doesn't involve any activity that causes alteration of any resource; therefore acquiring any specific legal right to do so is not applicable. However, the entitlement of the emission reductions generated by the project shall be transferred to the project developer from the beneficiary households through a signed covenant.

A.4. Location of project

A.4.1. Host Country

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Kenya

A.4.2. Region/State/Province etc.

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The biogas plants under the proposed project will be installed throughout Kenya.

A.4.3. City/Town/Community etc.

>> The project activity is currently implemented in Baringo, Bomet, Elgeyo-Marakwet, Embu, Kajiado, Kakamega, Kericho, Kiambu, Kirinyaga, Kissu, Kisumu, Meru, Muranga, Nukuru, Nandi, Nyamiria, Nyandarua, Tharaka-Nithi, Uasin Gishu. However, the project activity is aimed to be implemented in all parts of Kenya where the conditions to sell and install biodigesters are met.

A.4.4. Physical/Geographical location

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PP has given unique identification number to each plant like #Venta 8534, #Venta 8685…. Etc. These plants are located in various parts of Baringo, Bomet, Elgeyo-Marakwet, Embu, Kajiado, Kakamega, Kericho, Kiambu, Kirinyaga, Kissu, Kisumu, Meru, Murang'a, Nukuru, Nandi, Nyamiria, Nyandarua, Tharaka-Nithi, Uasin Gishu.

The project will be implements throughout Kenya. The details of geographical location are presented below.

	Coordinates
Latitude	0.0236° S
Longitude	37.9062° E

Figure 1: Map of Kenya[2]

A.5. Technologies and/or measures

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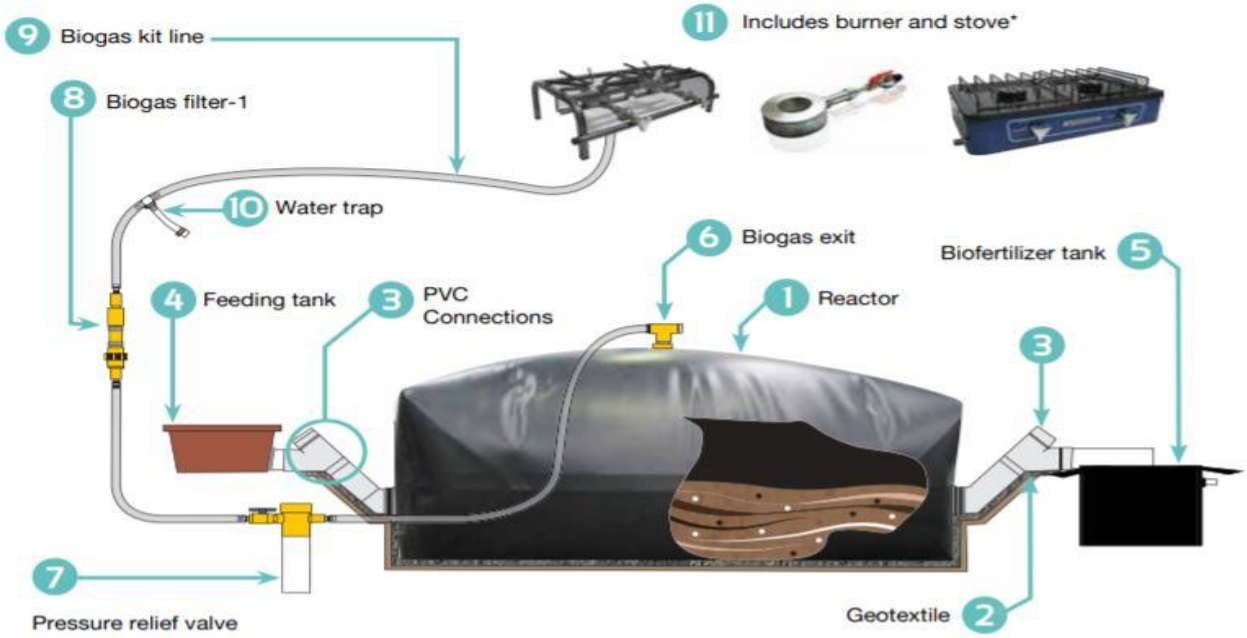
As described above project activity involves installation of biodigesters with Sistema.bio technology in Kenya. There is no technology transfer involved in the project activity. Details of working of the plant are as follows.

[2] Source: https://www.vectorstock.com/royalty-free-vector/republic-of-kenya-map-vector-1734682

Sistema.bio is a hermetic hybrid reactor which receives the daily waste of a farm and livestock. This waste manure is then mixed with water in order to allow fermentation. In the due process of fermentation methane-rich biogas and an organic fertilizer called boil are produced. Biogas is transported to different points of use like cookings stoves, burnes etc. The mixture left behind in the reactor is a powerful biofertilzer which is stored and applied in the fields as a substitute to chemical fertilizers. The various compents of the Sistema.bio reactor can be seen in Figure 2 below.

Figure 2: Sistema.bio Plant



The project contributes directly in achieving the SDG 8 &7 in addition to SDG 13 as required by Principle- 1 of GS4GG. The project will have following benefits:

- **Environmental Benefits**: Reduction in firewood consumption and emission of greenhouse gases, forest and biodiversity conservation (SDG 13).
- **Economic Benefits**: Employment creation (SDG 8).
- **Social Benefits**: The project will provide affordable and clean fuel copared to baseline scenario (SDG 7)

A.6. Scale of the project

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The project falls under waste handling and disposal, end use energy efficiency with emission reductions 405,610 tCO_2e per year with the total installed energy output of 690.27 $MW_{thermal}$. Hence, the project falls under large scale projects.

A.7. Funding sources of project

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No public funding from parties included in Annex I to the UNFCCC, is available to the project. The project is implemented by the client. Carbon waiver has been signed by the project owner and carbon rights are available with Good Farmland Management Kenya, LTD (local entity).

A.8. Assessment that project complies with 'gender sensitive' requirements

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Proposed project is developed pursuant to the "gender sensitive" requirements outlined in the "Gold Standard Gender Equality Guidelines and Requirements". As required for the purpose of the PDD as specified in the guidance note to this section, the project participants presents the assessment to questions included in step 1 to 3 in the respective guidelines and requirements.

1M) Does the project reflect the key issues and requirements of gender-sensitive design and implementation as outlined in the gender policy? Explain how.

The project respects the key gender issues and requirements of gender-sensitive design and implementation of the project. The project is aimed to avail the clean cooking solutions to the households. Biogas project will result in cutting down the firewood consumption. Therefore, the project will support environmentally sustainable consumption of firewood.

In the overwhelming majority of the households in Kenya, the kitchen chores (including the sourcing of fuel, cooking and cleaning) are handled by women. While getting involved most of the time with the kitchen related activities, women are more exposed to the indoor air pollution and the associated hazard. Situation is more aggravated with a fact that the women are also responsible for taking care of the children and the children who normally need mother's support to perform their activities are bound to accompany their mother in kitchen. This situation has led to enhanced exposure of the women and children to kitchen smoke and associated health consequences. Since the project aims to displace the polluting firewood from the kitchen, the primary beneficiary would be the women and children.

On the implementation side, the project has trained and deployed women in the marketing and construction of the biogas plant. Project implementer opines that promotional activities are better addressed with women in the forefront. During the life of the project, the project participant believes to create a conducive environment where women are ably capacitated todiscuss the needof a technology, create awareness of the product and process, and in long run, to organize themselves and create business opportunities for themselves. This women prioritized mode of project development and implementation helps address gender equality issues; in the meantime, addressing issues related to environmental sustainability and natural resource management.

2M. Does the project align with existing country policies, strategies and best practices? Explain how.

The project respects all the rights to the women conferred to them by the Republic of Kenya. Article 21 outlines the "Implementation of rights and fundamental freedoms.", Article 27 of the constitution highghts the "Equality and freedom from discrimination.". All these articles embrace the gender equality and social inclusion principles in a way or other. Kenya has accessioned 'International Convention on the Elimination of All Forms of Racial Discrimination :1969' [3]'International Covenant on Civil and Political Rights :1976'[4], 'International Covenant on Economic, Social and Cultural Rights :1976'[5], 'Convention on the Elimination of All Forms of Discrimination' against Women (1979)[6]. Kenya has also signed Protocol on the Rights of Women in Africa (2005)[7]. The project respects the spirit of all the mentioned conventions. The project is also in line with the objective of 'National Policy on Gender and Development' of Kenya.

[3] See: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-2&chapter=4&clang=_en

[4] https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-4&chapter=4&clang=_en

[5] See: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-3&chapter=4&clang=_en

[6] See: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-8&chapter=4&clang=_en

[7] See: https://www.un.org/en/africa/osaa/pdf/au/protocol_rights_women_africa_2003.pdf

3M. Does the project address the questions raised in the Gold Standard Safeguarding Principles & Requirements document? Explain how.

The questions on Gender Aspects raised in the Gold Standard Safeguarding Principles and Requirements document are answered in the Safeguarding Principle Assessment. There are no risks perceived by Stakeholders and the project developer due to the strong focus of the project on women as main beneficiaries.

4M. Does the project apply the Gold Standard Stakeholder Consultation & Engagement Procedure, Requirements & Guidelines? Explain how

Yes; following Gold Standard Stakeholder Consultation & Engagement Procedure, Requirements & Guidelines, a live local stakeholder consultation meeting was held on 29/01/2020 and detailed stakeholder consultation report is prepared and submitted.

SECTION B. Application of selected approved Gold Standard methodology

B.1. Reference of approved methodology

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The relevant project type and category is: Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 3.1 Reference:https://globalgoals.goldstandard.org/2166/

B.2. Applicability of methodology

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Justification for the choice of methodology is given below table:

Sr.No.	Criterion	Conditions
1	Clearly identifiable project boundary: The project boundary can be clearly identified, and the biodigesters counted in the project are not included in another voluntary market or CDM project activity (i.e. no double counting takes place). Project proponents must have a survey mechanism in place together with appropriate mitigation measures so as to prevent double-counting in case of another similar activity with some of the target area in common.	The project boundary is the physical, geographical site of Sistema.bio digester plants located within Kenya. The project is not registered with any other voluntary market thus, doesn't double count any of its emission reductions. The unique GPS coordinate of every plant is recorded along with the complete address of the plant site.
2	The biodigesters each have continuous useful energy outputs of less than 450 kWth per unit (defined as total energy delivered usefully from start to end of operation of a unit divided by time of operation).	The maximum energy output of the biodigesters implemented in the project activities is 8.20 kW_{th} per unit, below the indicated 450 kW_{th} limit per unit.

3	The use of the baseline technology as a backup in parallel with the Sistema.bio fuel launched by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology and the definitive discontinuity of its use. The project documentation must provide a clear description of the approach chosen and the monitoring plan must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of the improved technology. The success of the mechanism put into place must therefore be monitored, and the approach must be adjusted if proven unsuccessful.	Monitoring of the baseline technology usage will be done periodically. Detailed surveys will be conducted in order to get a feedback on the operation of the new technology and to measure the extent to which the baseline technology is still used. Along with this, the internal survey would include questions related to the reason behind the continued usage of the baseline technology.
4	The project proponent must clearly communicate to all project participants to whom the ownership rights of the emission reductions resulting from the project activity belong. This must be communicated to the technology producers and the retailers of the by contract or clear written assertions in the transaction paperwork.	The end user of each biodigester will confirm that they transfer the ownership of VERs to the Project p. Sample Copy of agreement with the end users is provided in Appendix 3.
5	Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules.	The project activity does not involve usage of any new biomass feedstock. Thus, this condition is not applicable to the project.
6	If more than one climate zone is included in the project activity, a distinction per climate zone must be considered. The distinct geographical boundary of each project area must be clearly documented in the project documentation,using representative GPS data.	Kenya is an African country, bisected by the Equator, yet it has three types of climate: hot and humid along the coast (zone 1), temperate in the west and south-west, where there are mountains and plateaus (zone 2), and finally, hot and dry in the north and east (zone 3) 8 .The project is applicable throughout Kenya but presently most of the plants are installed in Zone 2.

[8] See: https://www.climatestotravel.com/climate/kenya

Eligible Project Types:
Renewable energy Supply-
Project activity meets this criteria as it generates biogas from livestock manure and organic waste. Thus avoiding the conventional usage of the fuelwood in the absence of the project activity.

Project Types and Eligibility criterion:-
Project activity falls under below project type-
Project Type: Improved distributed heating and cooking devices (e.g. biodigesters, cook-stoves),
Project activity involves installation of household biodigesters and thereby replacing firewood. Biogas thus generated will be used for domestic thermal needs. Good Farmland Management Kenya, LTD has an agreement with all the plant owners involved in the project activity stating transferring of rights to Good Farmland Management Kenya, LTD. Every stakeholder was aware of the arrangement and ownership of the credits. Hence meeting the GS criterion.

B.3. Project boundary
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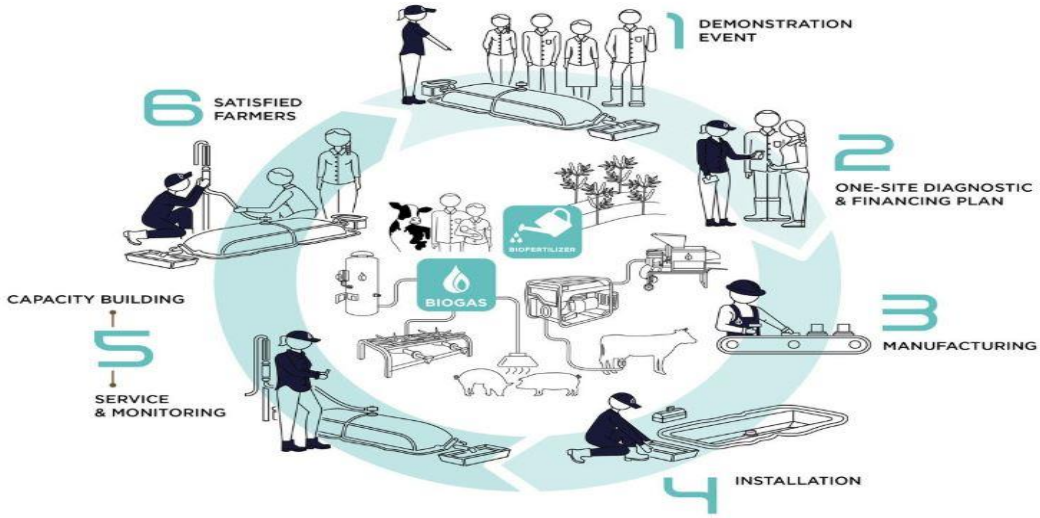
As per "Technologies and Practices to Displace Decentralized Thermal Energy Consumption" methodology the project boundary is:
The project boundary is the physical, geographical site of the use of biomass or the renewable energy through Kenya.

Therefore, the project boundary incorporates all the physical geographical sites of the Sistem.bio's biodigesters. In Year 1, a total of 1126 plants will be installed by Sistema.bio at various sites throughout the geographical boundary of Kenya.
The step wise installation process of the plant at the project site is demonstrated in the Figure 3 below.

Figure 3:Step-wise demonstration of plant installation



The emissions accounted from the various sources in the phycial boundary of the project activity are as follows:

For the purpose of GHG mitigation/sequestration following table shall be completed (delete if not required)

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Thermal Energy Need	CO_2	Yes	The major source of emissions in the baseline due to burning of firewood
		CH_4	No	Excluded for simplification, this is conservative.
		N_2O	No	Not applicable for the project activity
	Animal waste handling and storage	CO_2	No	Not Availed, as baseline emissions from "feed" are not considered
		CH_4	Yes	The major source of emission in baseline due to open dumping of animal manure
		N_2O	No	Not Availed, as baseline emissions from "feed" are not considered
Project scenario	Thermal Energy Need	CO_2	No	Not applicable for the project activity
		CH_4	No	Not applicable for the project activity
		N_2O	No	Not applicable for the project activity
	Direct emissions from the biodigester	CO_2	No	Excluded as CO_2 emissions from biogas incineration are CO_2 neutral
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

B.4. Establishment and description of baseline scenario

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Biomass contribution to Kenya's final energy demand is 70 per cent and provides for more than 90 per cent of rural household energy needs.[9] The main sources of biomass for Kenya include charcoal, wood-fuel and agricultural waste. Therefore making the default FNRB of Kenya to be 91.4%.[10] Thus, the baseline scenario is the usage of non-renewable fuels to meet the energy requirements in households of Kenya along with GHG emissions resulting from animal waste.

The proposed project activity aims to replace the conventional usage of non-renewable sources to suffice the domestic needs with much cleaner and sustainable source of energy i.e. Biogas. A baseline survey was conducted in various parts of the country. Majority of the households were found to be dependent on biomass to fullfill their domestic energy needs.

The details of the survey from the study are given in table 2 as follows:

Table 2: Details of the Baseline Survey

Capacity	Number of Biodigesters	Average Wood Consumption (kg/month)	Average LPG Consumption (kg/month)
6	40	331	77
8	52	462	7
12	45	617	96
16	13	304	11
20	12	673	12
30	1	25	13
40	9	1278	13
Total	**172**	**3689**	**230**

[9] https://renewableenergy.go.ke/index.php/content/29

[10] Calculated using TOOL 30: Calculation of the fraction of non-renewable biomass Version 02.0

B.5. Demonstration of additionality

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As described in section A.2 above, the project falls under GG4GG Community Services Activity Requirements. As per Annex-B Positive list under 'GG4GG Community Services Activity Requirements' the project meets the criteria 3 because the project activity is 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 MWh of energy savings per year or <=600 tonnes of emission reductions per year.

Prior Consideration:

As per GS4GG rule for retroactive projects, project documents need to submit to GS within one year of the project start date to meet prior consideration. In this case, the start date is 07/12/2018 and PP has submitted the initial project documents to GS on 06/12/2019. Therefore, the project meets the prior consideration requirements.

Ongoing financial Need:

Ongoing Financial Need shall be demonstrated at Design Certification Renewal (Refer clause 4.1.52 of GS4GG 'principle and requirements'

B.6. Sustainable Development Goals (SDG) outcomes

B.6.1. Relevant target for each of the three SDGs

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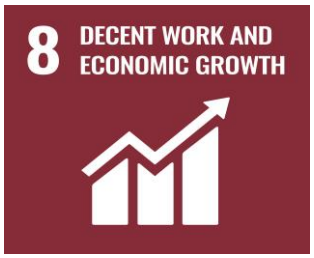
The table below discusses the relevant SDG target for each three SDGs addressed by the project.

SDGs	Targets
	The project will contribute to below targets: • Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value
	The project will contribute towards below targets: • Target 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services • Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix
	The project will contribute towards below targets: • Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning • Target 13.2: Integrate climate change measures into national policies, strategies and planning

B.6.2. Explanation of methodological choices/approaches for estimating the SDG outcome

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Methodological choices/approach for estimating SGD 13 outcomes:

As per "Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 3.1"

The emission reductions would be accounted from the following two sources:

(i) Methane emissions from Manure Management:

Baseline emissions due to Manure management have been accounted using IPCC TIER 2 approach as described in Annex 6 of the GS TPDDTEC methodology. The following equation has been used:

Equation (1)

$$BE_{awms,h} = GWP_{CH4} * \sum_{T} (EF_{awms(T)} * N_{(T),h})$$

Where:

$BE_{awms,h}$ = The baseline emission from handling of animal waste in premise h (tCO2e per year)

GWP_{CH4} = 25 tCO_2e per unit CH_4

$N_{(T)h}$ = The number of animals of livestock species per category T

$EF_{awms,T}$ = Emission factor for the defined livestock population category T, (tonCH4 per year)

The emissions factor $EF_{awms,T}$ for tier 2 approach is calculated using the following equation:

$$EF_{awms(T)} = VS_{(T)} * 365 * \left[Bo_{(T)} * D_{CH4} * \sum_{k} \frac{MCF_{BL,k}}{100} * MS_{(T,k)} \right]$$

Equation (2)

Where:

$EF_{awms,T}$ = CH_4 emission factor for livestock category T (tCH4 per animal per year)

VS (T) = Daily volatile solid excreted for livestock category T, (kg dry matter per animal per day)

365 = Basis for calculating annual VS production, (das per year)

$B_{0(T)}$ = Maximum methane production capacity for manure produced by livestock category T, (m3CH4 per kg of VS excreted)

D_{CH4} = Coverversion factor to convert to tCO_2 (0.00067)

$MCF_{(BL,k)}$ =Methane conversion factors for the animal waste handling system in the baseline situation, by climate zone k, (%)

$MS_{(T,S,k)}$ =Fraction of livestock category T's manure treated in animal waste management system, in climate region k (dimensionless)

(ii) Carbon dioxide emissions from the combustion of non reneweable energy sources (Fuelwood and LPG)

Emission reduction due to the consumption of non-renewable energy sources has been accountedin accordance with the "Technologies and Practices to Displace Decentralized Thermal Energy Consumption" methodology using the following equation .

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

Equation (3)

Where:

$B_{b,y}$	= Quantity of fuel consumed in baseline scenario b during year y, in tons,
f_{nrb}	= Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{b,fuel}$	=Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$Ef_{b,fuel,CO2}$	CO2 emission factor of the fuel that is substituted or reduced. 112 tCO2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel
$Ef_{b,fuel,non\text{-}CO2}$	= Non-CO_2 emission factor of the fuel that is substituted or reduced

Project Emissions (PEy): As per applied the GS TPDDTEC methodology version 3.1 , project emissions are accounted for below activities:

a) CO_2 emissions from on-site consumption of fossil fuels due to the project activity
b) CO_2 Emissions due continued use of the old technology.
c) CO_2 emissions from electricity consumption by the project activity
d) Methane emission from the biodigester which includes physical leakage and incomplete combustion of the biogas, as well as emissions from the animal waste not treated in the biodigester.
e) Project emissions related to cultivation of feedstock
f) Project emissions from transportation

From the above mentioned activities the following contribute to project emissions.

Project emissions due to continued use of baseline technology will be evaluated using the following equation:

$$PE_{p,y} = B_{p,y} * ((f\,NRB,\,y * EF_{p,fuel,\,CO2}) + EF_{p,fuel,\,nonCO2}) * NCVp,_{\,fuel}$$

Equation (4)

Where:

$PE_{p,y}$	Emissions for project scenario p during year y in tCO_2e
$B_{p,y}$	= Quantity of fuel consumed in project scenario p during year y, in tons,
f_{nrb}	= Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass
$NCV_{p,fuel}$	=Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$Ef_{p,fuel,CO2}$	CO_2 emission factor of the fuel that is substituted or reduced. 112 tCO_2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel

$Ef_{p,fuel,non-CO2}$ = Non-CO_2 emission factor of the fuel that is substituted or reduced

Methane emission from the biodigester which includes physical leakage and incomplete combustion of the biogas, as well as emissions from the animal waste not treated in the biodigester.

The first two components are calculated as a percentage of the methane produced, as per the following equation:

$$PE_{awms,h,y} = GWP_{CH4} * \sum (N_{(T),h,y} \cdot EFawms_T) \cdot PL_y + \sum (N_{(T),h,y} \cdot EFawms_T) \cdot (1 - \eta_{biogastove})(1 - PL_y)$$

Equation (5)

Where,

$N_{(T),h,y}$ = Number of animals of livestock category T in year y in premise h
$EF_{awms,T}$ = CH4 emission factor for livestock category T (tCH4 per animal per year)
PL_y = Default value of 10%
GWP_{CH4} = Global Warming Potential of Methane, 25
$\eta_{biogastove}$ = Combustion efficiency of the used type of biogas stove to account for incomplete combustion resulting in emission of methane postcombustion.

The methane emisisons from untreated waste will be estimated in accordance with equation 1 and 2 above with the following changed paramters

$MCF_{(P,S,k)}$ Methane conversion factors for the animal waste handling system used in addition to bio-digester in the project scenario by climate zone k, (%)
$MS_{(P,s,k)}$ Fraction of livestock category T's manure not treated in bio-digester, in climate region k, (dimensionless)

Leakage (LEy): As per applied GS TPDDTEC methodology version 3.1, leakage emissions are accounted for the following sources:

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.
b) Non-project users who previously used lower emitting energy sources use the non-renewable biomass or fossil fuels saved under the project activity.
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.
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.
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 project activity does not involve any of the above activities and hence leakage emissions have been taken as zero.

Methodological choices/approach for estimating SDG 8 and SDG 7 outcomes:

The project outcomes of these SDG will be in accordance with the following approach:

SDG Indicator	Selected Parameter	Apprach for estimation of the outcome
SDG 8/Indicator 8.5.1 and 8.5.2	Number of jobs generated	No specific calculations. Number of jobs generated every year due to the implementation of project activity will be monitored based on the HR records of Good

		Farmsland Ltd, Kenya
SDG 7/Indicator 7.1.2	Number of biogas system operational under the project activity	No specific calculations. No specific calculations are needed to be made for the parameter "Number of biogas system operational under the project activity"

B.6.3. Data and parameters fixed ex ante for monitoring contribution to each of the three SDGs

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$VS_{(T)}$
Unit	kg dry matter per animal per day
Description	Daily volatile solid excreted for livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	1.90
Purpose of data	Baseline emissions
Additional comment	365 = basis for calculating annual VS production, days per year

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$Bo_{(T)}$
Unit	m3CH4/kg VS
Description	Maximum methane production capacity for manure produced by livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.13
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$MCF_{(BL,k)}$
Unit	%
Description	Methane conversion factors for each manure management system by climate region k
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories

Value(s) applied	30%
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$MCF_{(P,S,k)}$
Unit	%
Description	Methane conversion factors for the animal waste handling system used in addition to bio-digester in the project scenario by climate zone k, (%)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	30%
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO2e
Data/parameter	$fNRB_{,y}$
Unit	%
Description	Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using nationally approved methods
Source of data	Calculated using TOOL 30: Calculation of the fraction of non-renewable biomass, Version 02.0
Value(s) applied	91.4%
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	GWP CH_4
Unit	tCO_2e per tCH4
Description	Global Warming Potential (GWP) of methane
Source of data	IPCC

Value(s) applied	25
Purpose of data	Baseline emissions
Additional comment	25 for the second commitment period. It shall be updated according to any future COP/MOP decisions.

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$Ef_{b,fuel,CO2}$
Unit	tCO_2/TJ
Description	CO_2 emission factor of the fuel that is substituted or reduced
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	Wood= 112 LPG= 63.1
Choice of data or Measurement methods and procedures	As per requirement of the methodology and Table 2.2 and 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines The IPCC is a standard, credible source of emissions factors.
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$Ef_{b,fuel,non-\ CO2}$
Unit	tCO_2/TJ
Description	Non- CO_2 emission factor of the fuel that is substituted or reduced.
Source of data	NA
Value(s) applied	0, As no non-CO_2 emissions occur in the baseline scenario
Choice of data or Measurement methods and procedures	NA
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$NCV_{b,fuel}$
Unit	TJ/tonne
Description	Net calorific value of fossil fuels used in the baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	Wood= 0.015 LPG= 0.0473
Choice of data or Measurement methods and procedures	As per requirement of the methodology and Table 1.2 , Chapter 1, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	$\eta_{biogastove}$
Unit	%
Description	Combustion efficiency of the biogas stove
Source of data	Manufacturer data
Value(s) applied	40.32%
Choice of data or Measurement methods and procedures	NA
Purpose of data	Baseline emissions
Additional comment	NA

B.6.4. Ex ante estimation of outcomes linked to each of the three SDGs

>>

(i) Methane emissions from Manure Management:

Emission reduction from manure management using IPCC 2006, tier-2 methodology using Equation 1 above.

Where the Value of $N_{(T),h}$ was taken based on the average cattle size corresponding to each capacity of the biodigester as given in table 3 below. GWP was taken as 25.

Table 3: Average Cattle size for each HH

Capacity (m3)	**No of Cattle/HH**
6	4
8	5
12	6
16	7
20	7
30	8
40	23

The tier 2 emission factor was calculated using equation 2 above using the following parameters:

Table 4: Parameters for calculating tier-2 manure management EF

Parameters	**Value**	**Unit**	**Source**
VS	1.90	kg/hd/day	IPCC 2006
Bo	0.13	m3CH4/kg VS	IPCC 2006
MCF	0.30	Fraction	IPCC 2006
DCH_4	0.00067	Conversion factor to tCO_2e	IPCC 2006

Using the above parameters and MS% values corresponsding to each capacity of Sistema.bio digester given in table 5 below. For now, the maximum MS% fed into the biodiester has been taken i.e. 100% to obtain the ex ante values. However the average real time values will be taken upon verification.
Accordingly,the following values of ex ante EF were obtained.

Table 5: Tier-2 emission factor for manure management

Capacity	**MS%**	**EF (tCH_4/per animal/year)**
6	100%	0.0181
8	100%	0.0181
12	100%	0.0181
16	100%	0.0181
20	100%	0.0181
30	100%	0.0181
40	100%	0.0181

Accordingly, the baseline emissions for manure management were estimated as follows:

Table 6: Year wise Baseline emissions from manure management (tCO_2e)

Capacity (m3)	Year 1	Year 2	Year 3	Year 4	Year 5
6	640	1,390	3,488	4,983	7,475
8	633	1,878	6,477	13,790	36,564
12	482	1,547	5,491	11,980	32,445
16	210	619	1,998	3,995	9,988
20	298	1,121	3,918	8,439	22,604
30	87	0	0	0	0
40	604	1,904	7,165	16,377	46,061
Total	2,953	8,460	28,537	59,564	1,55,137
Cummulative ER	**2,953**	**11,414**	**39,950**	**99,515**	**2,54,652**

(ii) CO_2 emissions from Fuelwood and LPG combustion:

The amount of firewood saved due to the project activity will be the baseline for calculating the emission reductions. This will be calculated using the following equation.

$$B_{b,y} = N_{p,y} * P_{b,y}$$

Where,

$N_{p,y}$ =Project technology-days in the project database for project scenario p through year y

$P_{b,y}$ =Specific fuel consumption for an individual technology in baseline scenario b during year y converted to tons/month

Whereas, the following value of $P_{b,y}$ was taken based on the baseline survey.

Capacity (m^3)	**Average Fuelwood Consumption (kg/month)**	**Average LPG Consumption (kg/month)**
6	331	77
8	462	7
12	617	96
16	304	11
20	673	12
30	25	13
40	1278	13

Therefore, the following values of $B_{b,y}$ were derived.

Capacity (m^3)	**$B_{b,y}$=Total Fuelwood Consumption (ton/year)**				
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
6	1528	3323	8336	11909	17864
8	1679	4981	17177	36571	96968
12	1429	4590	16286	35532	96233
16	230	678	2188	4375	10938
20	800	3005	10500	22616	60578
30	7	0	0	0	0
40	905	2852	10735	24538	69012
Total	6577	19429	65222	135541	351592
Cummultive Total	**6577**	**26006**	**91228**	**226769**	**578361**

Capacity (m^3)	**$B_{b,y}$=Total LPG Consumption (ton/year)**				
	2019	**2020**	**2021**	**2022**	**2023**
6	357	775	1945	2779	4168
8	26	78	270	574	1523
12	223	716	2540	5543	15012
16	8	25	79	158	396
20	14	54	189	407	1089
30	4	0	0	0	0
40	9	30	112	257	722
Total	642	1678	5135	9717	22909
Cummulative Total	**642**	**2320**	**7455**	**17172**	**40082**

The following parameters were used to estimate emission reduction due to the project activity.

Parameter	Fuelwood	LPG	Unit
f_{nrb}	91.4%	100%	Fraction
$Ef_{b,fuel,CO2}$	112	63.1	tCO_2/TJ
$Ef_{b,fuel,non-CO2}$	0	0	tCO_2/TJ
$NCV_{b,fuel}$	0.015	0.047	TJ/ton

Accordingly, the following values of $BE_{b,y}$ were estimated as follows:

Year	$BE_{b,y}$ (tCO_2e)
Year 1	12,015
Year 2	46,856
Year 3	162,334
Year 4	399,462
Year 5	1,007,715
Total	**1,628,381**

Project emissions due to continued use of the baseline technology and untreated waste will be monitored and reported in the monitoring report upon verification. For now, this value has been assumed to be zero.

Project emissions from the biodigester which includes physical leakage and incomplete combustion of the biogas has been calculated using equation 5 using on the following parameters

PL_y =10% (Default value)
GWP_{CH4} = Global Warming Potential of Methane, 25
$\eta_{biogastove}$ = 40.32%

Based on the above parameters, the PE due to physical leakage and incomplete combustion of biogas was calculated as follows:

Capacity (m^3)	2019	2020	2021	2022	2023
Sistema 6	14	30	75	107	161
Sistema 8	14	41	139	296	786
Sistema 12	11	33	118	258	697
Sistema 16	5	14	43	86	215
Sistema 20	7	24	84	182	486
Sistema 30	2	0	0	0	0
Sistema 40	14	42	155	353	991
Total	66	184	616	1,282	3,336
Cummulative PE	**66**	**251**	**866**	**2,149**	**5,484**

B.6.5. Summary of ex ante estimates of each SDG outcome

Year	Baseline estimate	Project estimate	Net benefit
Year 1	14,968	66	14,902
Year 2	58,270	251	58,019
Year 3	202,284	866	201,418
Year 4	498,976	2149	496,828

Year 5	1,262,366	5484	1,256,882
Total	2,036,865	8816	2,028,049
Total number of crediting years	5		
Annual average over the crediting period	407,373	1763	405,610

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO2e
Data/parameter	$EF_{awms,T}$
Unit	tCH4per animal per year
Description	Animal waste methane emission factor by average Temperature
Source of data	Calculated using Data from 2006 IPCC Guidelines for National Greenhouse Gas Inventories and internal survey
Value(s) applied	For Cattle Capacity (m^3) / $EF_{awms,T}$ 6 / 0.0181 8 / 0.0181 12 / 0.0181 16 / 0.0181 20 / 0.0181 30 / 0.0181 40 / 0.0181
Measurement methods and procedures	Calculated using the equation 2 of this PDD.
Monitoring frequency	Annually
QA/QC procedures	The average MS% for each capacity of biodigester would be taken into consideration for calculation and will vary upon verification.
Purpose of data	Baseline emissions
Additional comment	NA

Relevant SDG Indicator	Climate Action (SDG 13) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data / Parameter	$MS_{(T,S,k)}$
Unit	%
Description	Fraction of livestock category T's manure fed into the bio-digester, S in climate region k
Source of data	Internal survey
Value(s) applied	**Capacity** | **$MS_{(T,s,k)}$%** **6** | 100% **8** | 100% **12** | 100% **16** | 100% **20** | 100% **30** | 100% **40** | 100%
Measurement methods and procedures	Monitoring shall consist of getting an estimate of the fraction of manure fed into the biodigester for a particular type of biodigester.
Monitoring frequency	Annually
QA/QC procedures	The average MS% for each capacity of biodigester would be taken into consideration for calculation upon verification.
Purpose of data	Baseline Emissions estimation
Additional comment	NA

<table>
<tr><td>Relevant SDG Indicator</td><td>Climate Action (SDG 13)
Target: 13.2: Integrate climate change measures into national policies, strategies and planning
Indicated as Emission reduction in tCO_2e</td></tr>
<tr><td>Data / Parameter</td><td>$MS_{(P,S,k)}$</td></tr>
<tr><td>Unit</td><td>%</td></tr>
<tr><td>Description</td><td>Fraction of livestock category T's manure not fed into the bio-digester, S in climate region k</td></tr>
<tr><td>Source of data</td><td>Internal survey</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Capacity</th><th>$MS_{(p,s,k)}$%</th></tr>
<tr><td>6</td><td>0%</td></tr>
<tr><td>8</td><td>0%</td></tr>
<tr><td>12</td><td>0%</td></tr>
<tr><td>16</td><td>0%</td></tr>
<tr><td>20</td><td>0%</td></tr>
<tr><td>30</td><td>0%</td></tr>
<tr><td>40</td><td>0%</td></tr>
</table>
</td></tr>
<tr><td>Measurement methods and procedures</td><td>Monitoring shall consist of getting an estimate of the fraction of manure fed into the biodigester for a particular type of biodigester.</td></tr>
<tr><td>Monitoring frequency</td><td>Annually</td></tr>
<tr><td>QA/QC procedures</td><td>The average MS% for each capacity of biodigester would be taken into consideration for calculation upon verification.</td></tr>
<tr><td>Purpose of data</td><td>Baseline Emissions estimation</td></tr>
<tr><td>Additional comment</td><td>NA</td></tr>
</table>

Relevant SDG Indicator	Climate Action (SDG 13) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data / Parameter	$N_{(T)}$
Unit	Number per household
Description	Number of animals of livestock category T
Source of data	Survey
Value(s) applied	**Capacity (m^3)** / **No of Cattle/HH** 6 / 4 8 / 5 12 / 6 16 / 7 20 / 7 30 / 8 40 / 23
Measurement methods and procedures	Monitoring shall consist of estimation of the livestock or a representative sample thereof, at least once every year.
Monitoring frequency	Annually
QA/QC procedures	The sample size for the annual survey would be estimated based on simple random sampling.[11] The details of the same have been explained in section B.7.2 below.
Purpose of data	Baseline Emissions estimation
Additional comment	NA

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Relevant SDG Indicator	13 (Climate Action) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data/parameter	PL_y
Unit	%
Description	Physical leakage of the biodigester
Source of data	IPCC default value
Value(s) applied	10%
Measurement methods and procedures	Updated in accordance with IPCC guidance
Monitoring frequency	Bienially
QA/QC procedures	The PP will check biennially if there are new IPCC default values applicable
Purpose of data	Baseline emissions
Additional comment	NA

<table>
<tr><td>Relevant SDG Indicator</td><td>Climate Action (SDG 13)
Target: 13.2: Integrate climate change measures into national policies, strategies and planning
Indicated as Emission reduction in tCO_2e</td></tr>
<tr><td>Data / Parameter</td><td>$\mathbf{P}_{b,y}$</td></tr>
<tr><td>Unit</td><td>Tonnes/month</td></tr>
<tr><td>Description</td><td>Quantity of fuel consumed in baseline scenario b during year y, in tons/month</td></tr>
<tr><td>Source of data</td><td>Survey</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><td>Capacity (m^3)</td><td>Average Fuelwood Consumption (tonnes/month)</td><td>Average LPG Consumption (tonnes/month)</td></tr>
<tr><td>6</td><td>0.331</td><td>0.077</td></tr>
<tr><td>8</td><td>0.462</td><td>0.007</td></tr>
<tr><td>12</td><td>0.617</td><td>0.096</td></tr>
<tr><td>16</td><td>0.304</td><td>0.011</td></tr>
<tr><td>20</td><td>0.673</td><td>0.012</td></tr>
<tr><td>30</td><td>0.025</td><td>0.013</td></tr>
<tr><td>40</td><td>1.278</td><td>0.013</td></tr>
</table>
</td></tr>
<tr><td>Measurement methods and procedures</td><td>This parameter will be monitored based on an internal survey conducted by the client on an annual basis for each monitoring period.</td></tr>
<tr><td>Monitoring frequency</td><td>Annually</td></tr>
<tr><td>QA/QC procedures</td><td>The sample size for the annual survey would be estimated based on simple random sampling.[12] The details of the same have been explained in section B.7.2 below.</td></tr>
<tr><td>Purpose of data</td><td>Baseline Emissions estimations</td></tr>
<tr><td>Additional comment</td><td>NA</td></tr>
</table>

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Relevant SDG Indicator	Climate Action (SDG 13) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data / Parameter	$N_{p,y}$
Unit	Project technology days
Description	Project technology-days in the project database for project scenario p through year y
Source of data	Internal Survey
Value(s) applied	3,07,42,490
Measurement methods and procedures	Monitoring consist of checking of representative sample, to ensure the biodidgester's operating
Monitoring frequency	Continuous
QA/QC procedures	The value will be based on the number of operational days. The number of operational days have been assumed to be 365 and will change upon verification
Purpose of data	Baseline Emissions estimations
Additional comment	NA

Relevant SDG Indicator	Climate Action (SDG 13) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data / Parameter	$U_{p,y}$
Unit	Percentage
Description	Usage rate in project Scenario p during year y
Source of data	Internal Survey
Value(s) applied	100%
Measurement methods and procedures	Annual or more frequently, in all cases on time for any request for issuance
Monitoring frequency	Annually
QA/QC procedures	The sample size for the annual survey would be estimated based on simple random sampling.[13] The details of the same have been explained in section B.7.2 below.
Purpose of data	Project Emissions estimations
Additional comment	NA

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Relevant SDG Indicator	Climate Action (SDG 13) Target: 13.2: Integrate climate change measures into national policies, strategies and planning Indicated as Emission reduction in tCO_2e
Data / Parameter	$P_{p,y}$
Unit	Tonnes/year
Description	Quantity of fuel consumed in the project scenario p during year y, in tons
Source of data	Internal survey
Value(s) applied	0
Measurement methods and procedures	This parameter will be monitored based on an internal survey conducted by the client on an annual basis for each monitoring period.
Monitoring frequency	Annually
QA/QC procedures	The sample size for the annual survey would be estimated based on simple random sampling.[14] The details of the same have been explained in section B.7.2 below.
Purpose of data	Project Emissions estimation
Additional comment	NA

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Relevant SDG Indicator	SDG: Decent work and economic growth (SDG 8) Target: 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value Indicator 8.5.1: Average hourly earnings of female and male employees, by occupation, age and persons with disabilities Indicator 8.5.2: Unemployment rate, by sex, age and persons with disabilities
Data / Parameter	Number of jobs generated by the project
Unit	Qualitative
Description	Employment generated by the project
Source of data	HR records
Value(s) applied	250
Measurement methods and procedures	NA
Monitoring frequency	Annual
QA/QC procedures	Transparent data and reporting
Purpose of data	Sustainable development assessment
Additional comment	NA

Relevant SDG Indicator	SDG: Affordable and clean energy (SDG 7) Target 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services Indicator: 7.1.2: Proportion of population with primary reliance on clean fuels and technology
Data / Parameter	Access to affordable and clean energy services
Unit	Numbers
Description	Number of biogas system operational under the project activity
Source of data	Project Participant/Project proponent
Value(s) applied	84,226
Measurement methods and procedures	Sample survey to confirm if project biogas systems are operational. Operational status will confirm that the users are accessed to affordable and clean energy and proportion of users reliance on clean fuel and technology.
Monitoring frequency	Annual
QA/QC procedures	Reqired sample size shall be determined following UNFCCC sampling standard
Purpose of data	Sustainable development assessment
Additional comment	NA

B.7.2. Monitoring plan

>> The monitoring plan chalks out the relevant data to be monitored, collected, assesed and archived according to the methodology. Data from the monitoring procedures will be recorded in the electronic project database and summarised in an annual Monitoring Report. Data collection will be in accordance with the Standard on "Sampling and surveys for CDM project activities and programme of activities (Version08)".

Objectives and reliability requirements

The objective of the sampling effort is to meet the monitoring requirements set forth in the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (Version 3.1). An annual ,monitoring system will be set up for most parameters. However, for parameters which can be tracked on a biennial basis will be monitored once every two years.

Target population

The monitoring procedure is targeted to be applied on the households, local communities and SMEs installed Sistemabio's devices., as identified through the Project Database managed by Sistema.bio.

Sampling method

A simple random sampling based on guidelines on "Sampling and surveys for CDM project activities and programme of activities Version 04" will be adopted for estimating the sample size for the monitoring surveys. Simple random sampling is suitable for homogenous populations.

Sample Size:

The minimum total sample size is 100, with at least 30 samples for project technologies of each age being credited. The majority of interviews in a usage survey must be conducted in person and include expert observation by the interviewer within the kitchen in question, while the remainder may be conducted via telephone by the same interviewers on condition that in-kitchen observational interviews are first concluded and analyzed such that typical circumstances are well understood by the telephone interviewers.

For rest of the monitoring parameters, the following simple random sampling equation will be used to get the sample size taking 90/10 confidence level.

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1)\times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$

Equation(5)

Where:

n	= Sample Size
N	= Total number of Households
P	= Our expected proportion
1.645	= Represents the 90% confidence required
0.1	= Represents the 10% relative precision

Sampling frame: All the households with biogas digester within the project will be the sampling frame.

Data to be monitored:

The necessary data as stated in section B.7.1 above will be collected and monitored by the project proponent as required.

Quality Assurance/Quality Control:

The client manages its data through a digital application which consists of questions relevant to the monitoring plan as defined in section B.7.1 above. The survey will be performed by the local

representative of the client through a digital app. In order to avoid the possibility of low response rate and answer bias 10% oversampling will be applied by the client.

Analysis:
The survey data will then be analysed by the project developer to derive the working status of each biodigester and the consumption of firewood/LPG at the project site (if any). The anaylsis will form the basis of the monitoring report to be prepared by the developer.

Implementation:
Preparation and pre-testing of the survey questionnaire will be done. Field personnel will be trained to conduct the surveys so as to ensure the quality of data collected is high. The schedule for implementing the sampling effort shall be defined prior to the field activity.

SECTION C. Duration and crediting period

C.1. Duration of project

C.1.1. Start date of project

>>

07/12/2018 is considered as start date of the project. The date represents first batch of biogas digesters installed within the project activity. PP has submitted initial documents for preliminary review on 06/12/2019. Therefore, as per clause 3.4.7 under principle and requirement one year prior to first submission date is taken as start date of the project activity.

C.1.2. Expected operational lifetime of project

>>
15 years[15]

C.2. Crediting period of project

C.2.1. Start date of crediting period

>> 07/12/2018

C.2.2. Total length of crediting period

>>
5 years renewable

SECTION D. Safeguarding principles assessment

D.1. Analysis of social, economic and environmental impacts

>>

15 Based on internal testing by Sistema.bio

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
SOCIAL & ECONOMIC SAFEGUARDING PRINCIPLES			
Principle 1 - Human Rights			
a) Recognises the centrality of human rights to sustainable development, poverty alleviation and ensuring fair distribution of development opportunities and benefits; and supports "universal respect for, and observance of, human rights and fundamental freedoms for all".	The project replaces conventional firewood usage with biogas for domestic cooking and heating purpose. Therefore, it provides development opportunity to all section of people proving cleaner fuel, better livelihood and empowering specially rural women. Hence, the project positively recognizes human rights to sustainable development.	No	Not Applicable
(b) Does not recognise or support Projects that contribute to violations of a state's human rights obligations and the core international human rights treaties, and seeks to support the protection and fulfilment of human rights.	The project is in accordance with constitution of Kenya and is bound to follow the rules and regulation of host country. Therefore, the project complies with articles compriing "Part 2. Rights and fundamental freedoms"[16] of the Kenyan Constitution. Hence, the project does not violate human rights obligations adopted by the host country.	No	Not Applicable
(c) Upholds the principles of accountability and the rule of law, participation and inclusion, and equality and non-discrimination, noting that prohibited grounds of discrimination include race, ethnicity, gender, age, language, disability, sexual orientation, religion, political or other opinion, national or social or geographical origin, property, birth or	Article 21 outlines the "Implementation of rights and fundamental freedoms.", Article 27 of the constitution hilighghts the "Equality and freedom from discrimination."Therefore, the project being in Kenya upholds the principles of accountability and the rule of law, participation and inclusion, and equality and non-discrimination.	No	Not Applicable

16 See: http://www.klrc.go.ke/index.php/constitution-of-kenya/112-chapter-four-the-bill-of-rights/part-2-rights-and-fundamental-freedoms

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
other status including as an indigenous person or as a member of a minority.			
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	The constitution of Kenya upholds the protection of Human rights thus, the project is bound to follow the rules and ruglation of host country. In addition, Kenya has ratified 'International Convention on the Elimination of All Forms of Racial Discrimination :1969' 'International Covenant on Civil and Political Rights :1976', 'International Covenant on Economic, Social and Cultural Rights :1976', 'Convention on the Elimination of All Forms of Discrimination' against Women (1979). Kenya has also signed Protocol on the Rights of Women in Africa (2005). Therefore, the project developer and the project do respect nationally and internationaly proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind.	No	Not Applicable
The Project shall not discriminate with regards to participation and inclusion.	Kenya has ratified 'International Convention on the Elimination of All Forms of Racial Discrimination :1969', Convention on the Elimination of All Forms of Discrimination against Women (1979) in addition to Article 27 of its constitution. Therefore, the project will not discriminate with regards to participation and inclusion.	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Principle 2 - Gender Equality and Women's Rights			
(i) Promotes gender equality and the empowerment of women.	Apart from being a member of the above mentioned conventions, Kenya has 'National Policy on Gender and Development' which aims to guarantee Kenyan men and women equality before the law, and to enable men and women to have equal access to economic and employment opportunities. The project positively contributes towards the vision of this policy which promotes gender equality and women empowerment.	No	Not Applicable
(ii) Does not recognise Projects that contribute to discrimination against women or reinforce gender-based discrimination and/or inequalities.	As explained above the project does not contribute to discrimination against women or reinforce gender-based discrimination and/or inequalities.	No	Not Applicable
(iii) Recognises and seeks to contribute to SDG 5, (Achieve gender equality and empower all women and girls).	Project compliance to SDG 5 is explained in section A.8 above.	No	Not Applicable
Mandatory requirements:			
1. The Project shall complete the following gender assessment questions			
Is there a possibility that the Project might reduce or put at risk women's access to or control of resources, entitlements and benefits?	No. The project uses cattle dung and waste as resource to generate biogas. Therefore, it does not put any risk to women's access or control of resources, entitlements and benefits.	No	Not Applicable
Is there a possibility that the Project can adversely affect men and women in marginalised or vulnerable communities (e.g., potential increased burden on women or social isolation of men)?	No, the project will be implemented in households where users depend firewood and conventional cooking stoves. The project replaces the conventional cooking practice with clean biogas based system. Hence, the project does not affect any marginalized or vulnerable communities.	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Is there a possibility that the Project might not take into account gender roles and the abilities of women or men to participate in the decisions/designs of the project's activities (such as lack of time, child care duties, low literacy or educational levels, or societal discrimination)?	No, the project actually takes care the upliftment of women and men who otherwise spent more time in sourcing firewood which in the project case not needed, This provides more time to the users. Also biogas being clean fuel, leads to low smoke generation resulting health benefits to end users.	No	Not Applicable
Does the Project take into account gender roles and the abilities of women or men to benefit from the Project's activities (e.g., Does the project criteria ensure that it includes minority groups or landless peoples)?	Yes, the project takes care the role of women in cooking. In presence of the project activity, women who generallywho in most cases are responsible for cooking, spend less time in sourcing firewood. This time can be utilize for other productive work. Also due to clean nature of the fuel, smoke related health issues are reduced due to the project activity.	No	Not Applicable
Does the Project design contribute to an increase in women's workload that adds to their care responsibilities or that prevents them from engaging in other activities?	No, the project takes care of the role of women in cooking. Due to the project women (generally the caretaker of cooking) spend less time in sourcing firewood and can utilize the saved time in other productive works. Also due to clean nature of the fuel, smoke related health issues are reduced due to the project activity.	No	Not Applicable
Would the Project potentially reproduce or further deepen discrimination against women based on gender, for instance, regarding their full participation in design and implementation or access to opportunities and benefits?	No, the project does not have any scope which may result to discrimination against women. The project contributes positively to uplift women in its work culture.	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and priorities of women and men in accessing and managing environmental goods and services?	No, the project helps in protecting NRB. Thus, it does not limit women's ability to use or protecting natural resources.	No	Not Applicable
Is there a likelihood that the proposed Project would expose women and girls to further risks or hazards?	No, the project replaces conventional cooking system with clean biogas. Biogas is safe to use and handle. Compared to firewood based cookimg system the likelihood of fire hazard is negligible in the project scenario. It reduces the exposure to smoke duringcooking system. Hence, project does not lead to more hazaradous conditions.	No	Not Applicable
2. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women. Specifically, this shall include (not exhaustive):			
Sexual harassment and/or any forms of violence against women - address the multiple risks of gender-based violence, including sexual exploitation or human trafficking	The project happens in individual households. It does not involve any women workforce which may lead to sexual harassment.		Not Applicable
Slavery, imprisonment, physical and mental drudgery, punishment or coercion of women and girls.	No, The project happens in individual households. It does not involve any women workforce which may lead to sexual harassment.	No	Not Applicable
Restriction of women's rights or access to resources (natural or economic).	No, The project actually takes care the upliftment of women and men who otherwise spent more time in sourcing firewood which in the project case not needed, This provides more time to the users. Also biogas being clean fuel, leads to low smoke generation resulting health benefits to end users.	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Recognise women's ownership rights regardless of marital status - adopt project measures where possible to support to women's access to inherit and own land, homes, and other assets or natural resources	Yes, The project does not have any scope which needs to recognise the women's ownership rights. The project replaces conventional firewood based cooking system with clean biogas. This helps women to have access to cleaner cooking technologies.	No	Not Applicable
3. Projects shall apply the principles of nondiscrimination, equal treatment, and equal pay for equal work, specifically			
Where appropriate for the implementation of a Project, paid, volunteer work or community contributions will be organised to provide the conditions for equitable participation of men and women in the identified tasks/activities	Yes, the project involves construction of biogas digesters at households. Trained labours are used for the same. Local people are engaged for the same. No discrimination either in gender or any other form is followed to engage local people.	No	Not Applicable
Introduce conditions that ensure the participation of women or men in Project activities and benefits based on pregnancy, maternity/paternity leave, or marital status	This is not applicable. The project does not have any scope of men and women participation where project developer has to ensure condition of benefits related to pregnancy, maternity/paternity leave, or marital status .	No	Not Applicable
Ensure that these conditions do not limit the access of women or men, as the case may be, to Project participation and benefits	Not applicable. Project happens at individual households where household people operate the biogas system as per their requirements.	No	Not Applicable
4. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks	The project does not has any scope to apply gender strategy as such. Although the project positively contributes towards the National Policy on Gender and Development .	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Principle 3 - Community Health, Safety and Working Conditions			
(a) Requires Projects to anticipate and avoid adverse impacts on the health and safety of affected communities during the Project's life cycle from both routine and non-routine circumstances	The project leads to safe working condition and improvement in health as it will replace firewood as fuel with biogas which is clean and safe.	No	Not Applicable
b) Requires Projects to provide workers with safe and healthy working conditions and to prevent accidents, injuries, and disease.	The project leads to safe working condition and improvement in health as it will replace firwood as fuel with biogas which is clean and safe. Further, periodic maintenance by implementing agency ensure prevention of any unsafe working condition.	No	Not Applicable
Principle 4 - Cultural Heritage, Indigenous Peoples, Displacement and Resettlement			
Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g., knowledge, innovations, or practices)?	The project area covers households which does not have any structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture. Hence, not applicable.	No	Not Applicable
Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	The project area covers households which does not require relocation of peoples; hence not applicable.	No	Not Applicable
Does the Project require any change to land tenure arrangements and/or other rights?	No, the project does not require any change to land tenure arrangements and/or other rights?	No	Not Applicable
For Projects involving land-use tenure, are there any uncertainties with regards land tenure, access rights, usage rights or land ownership?	No, the project does not invove any land use which will have issues related to land tenure or access right.	No	Not Applicable
Are indigenous peoples present in or within the area of influence of the	No, the project involves household biogas digesters. Therefore, it does not involve	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Project and/or is the Project located on land/territory claimed by indigenous peoples?	any influence towards indigenous people.		
Principle 5 – Corruption			
The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects	The project benefits households with clean fuel (biogas). Therere is no corruption provision in the project activity.	No	Not Applicable
Principle 6 - Economic Impacts			
Labour Rights: The Project Developer shall ensure that there is no forced labour and that all employment is in compliance with national labour and occupational health and safety laws, with obligations under international law, and consistency with the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. Where these are contradictory and a breach of one or other cannot be avoided, then guidance shall be sought from Gold Standard	The project does not require labour force for implementation of the project. Trained technicians are involved in construction and operation and maintence of plants. Therefore, no forced labour is involved in the project. No child labour is involved.	No	Not Applicable
ENVIRONMENTAL & ECOLOGICAL SAFEGUARDING PRINCIPLES			
Principle 1 - Climate and Energy			
Emissions: Will the Project increase greenhouse gas emissions over the Baseline Scenario?	No, the project will replace firewood use with biogas. Hence, it will reduce greenhouse gas emissions over the Baseline Scenario.	No	Not Applicable
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	No, the project uses inhouse cattle dung and waste only.	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
(such as wood, biomass) that provides for other local users?			
Principle 2 – Water			
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, Water in huge quantity is not required for the project which can impact the ground water level or any seasonal flow.	No	Not Applicable
Erosion and/or Water Body Instability: Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion? If 'Yes' or 'Potentially' proceed to question 2.	No, Water in huge quantity is not required for the project which can impact the ground water level or any seasonal flow.	No	Not Applicable
Principle 3 – Environment, ecology and land use			
Landscape Modification and Soil			
Does the Project involve the use of land and soil for production of crops or other products?	No, the project does not involve any crop production.	No	Not Applicable
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, the project activity takes place at individual households. There is no activity which can affect adversely the natural system to cause earthquake, landslides, erosion, flooding, draught or other extreme climatic conditions.	No	Not Applicable
Genetic Resources			
Could the Project be negatively impacted by the use of genetically	Not applicable. The project does not involve any crop production or cultivation.	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)?			
Release of pollutants			
Could the Project potentially result in the release of pollutants to the environment?	No, the project does not release any pollutants to the environment.	No	Not Applicable
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?	Not applicable. The project does not invlve any production process.	No	Not Applicable
Pesticides & Fertilisers			
Will the Project involve the application of pesticides and/or fertilisers?	Not applicable. The project does not involve any crop production or cultivation.	No	Not Applicable
Harvesting of Forests			
Will the Project involve the harvesting of forests?	Not applicable. The project happens at individual households.	No	Not Applicable
Food: Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	Not applicable	No	Not Applicable
Animal husbandry: Will the Project involve animal husbandry?	No	No	Not Applicable
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?	Not Applicable	No	Not Applicable

Safegaurding principle	Description of relevance to the project	Assessment (Yes/Potentially/No)	Mitigation Measures
Endangered Species: Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)?	Not Applicable	No	Not Applicable

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from stakeholders

>>

The local stakeholder consultation meeting for the project was held on 29th January 2020 in Githunguri, Sistema Kiambu Office. The stakeholders were invited to this meeting through email, public and personal invitations. The meeting was attended by 13 the individuals comprising of the Sistema.bio users and local group representatives. The stakeholder feedback round was also conducted for two months from 7/2/2020 onwards on the web[17] [18]. The stakeholders were informed about this through email.

Design of physical meeting(s)

i. Agenda

A clear agenda for with timeschedule for the stakeholder consultation meeting is as f

Agenda	
Time	Activity/Session
10:00 - 10:30 AM	Registration of participants
10.30 – 10.45 AM	Welcome Address and opening of the meeting • Introduction of the participants • Explaining the goal of the meeting
10.45 – 11.00 AM	Explanation of the project • Background of the project • Aim of the project • Project Benefits • Other relevant details
11.00 – 11.30 AM	Blind SD exercise (Discussion on Sustainable Development Principles) • Explanation of 17 SDGs to the Stakeholders • Identification of relevant SDGs by the

17 See: https://sistema.bio/ke/downloads/

18 See: https://www.southpole.com/uploads/media/sistembio-final-pdd.pdf

	stakeholders with respect to the project • Discussion on monitoring of SDGs
11.30- 12.30 PM A	Q/A Session for clarification about the project
d 12.30 - 1.00 PM e t a i l	Discussion of continuous input / grievance expression process • Seek inputs from stakeholders on the best methods for continuous consultation • Discussion on the complaint procedures and protocols with the stakeholders
e 1.00 -1.15 pm d	Concluding Address and Feedback from Stakeholders

description of each section of the agenda is as follows:

- Opening of the meeting

The opening meeting involved welcome note, purpose of the LSC and explanation about the project. Ms. Deepshikha Singh, opened the meeting and introduced herself, the organization Swiss Carbon Value Ltd. This was followed by a few words from Ms. Esther Altorfer who gave a brief introduction of Sistema.bio and its digesters. The introductory session lasted for around half an hour where the participants were made acquainted with the project.

- Explanation of the project

The stakehokders were informed about the project by highlighting the key project information elucidated in English as well as the local languages (Swahili and Kikuyu). Benefits of use of Sistema.bio digesters against fire wood or other non-renweable energy sources was explained in line with the sustainable development goals. The stakeholders were given an account of the GHG emission reductions from the project and its development under the Gold Standard.

- Blind SD exercise

As a part of the requirement of the GS, the organizers involved the participants in performing a blind exercise on Sustainable Development indicators in accordance with the GS4GG principles and requirements. The participants were not disclosed with the SD indicators identified by the design team and they were encouraged to identify relevant SD indicators related with the project. In order to make sure that the exercise doesn't get out of track, facilitation was done by the proponent. Once the indicators were identified, the participants were asked to score the relevance of the indicator as the project will have positive or negative impact on it. For each indicator identified, the monitoring parameter was discussed. The discussion was held in plenary .

- Discussion on Sustainable Development and its monitoring

A discussion was initiated to discuss the sustainable development aspect of the project and how will it be monitored. The outcome of the discussion indicated that the stakeholders found the project to be a clenn, economical, environment friendly and

healthy source of energy which was in line with the SDGs identified by the project proponent.

- Questions for clarification about the project

The question/answer session was organized to receive feedback from the participants and clarify their queries. While the clarifications sought by the participants during the introductory sessions were clarified instantly, this session was opened to attend some more questions on the project. Majority of the questions were related to the project implementation arrangement, post installation service, fees incurred and life of bio-digesters, safety measures. Key questions raised by the participants and the clarifications provided to them are presented below:

Questions	**Answers**
Can the bioslurry be dried for transport to farms that are a distance away?	The project proponent advised that the slurry is used in its watery form for maximum nutrients. It can however be added onto a compost heap which can then be transported to the farms easier.
Is dilution of the slurry necessary?	The project proponent informed that diluting of the slurry depends on the crops planted. A farmer can choose to use it as it is (trees, tea, etc) or dilute (greens and other vegetables).
Must a farmer use only cowdung?	The project proponent informed that for the initial feeding, cowdung is used to introduce the bacteria into the biodigester. Afterwards, farmers can use pig waste, chicken waste or even food waste in different ratios.
Can there be too much water in the digester?	The project proponent informed that yes, there can be too much water in the digester in certain scenarios. If the farmer feeds too much water against waste then there will be production of gas that will not light up. It is advised that the waste fed into the feeding tank has a porridge-like consistence.

In case of a leakage, how dangerous is the gas?	The project proponent informed that the biogas produced is of low pressure. Therefore, it cannot explode and has very low threat in case of leakage. Farmers were advised to however aerate the room in case of a leakage to allow for fresh air into the kitchen.
Can the biodigester be shared?	The project proponent informed that yes, the biodigesters can be shared depending on the distance of the secondary kitchen from the biodigester.

- Discussion of continuous input /grievance mechanism

The project propoent informed the users about the input and grievance mechanism. They were informed about the maintenance of a grievance expression book which would be maintained to have a contious account of stakeholder's feedback. Whenever the users have grievances related to biogas plant and the project as a whole, the first point of contact shall be Ms. Joyce Njeri, who will further communicate the issue to the concerned authority. Stakehodlers were provided below details to register their issues:

Ms. Joyce Njeri
Customer careTeam leader,Sistema.bio Kenya
Phone: 0800 720 109 (toll free number)
Email: kenya@sistema.bio

- Closure of the meeting

The project proponent summarized the LSC meeting and reiterated the objectives of the project and its benefits. Feed-back forms were collected from stakeholders and finally, a thank you note was delivers to all the participants for their interactive participation and the closure of the meeting was announced.

E.2. Summary of comments received

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Most of the participants thought that the project saves time and money. Thus, it is very economical and also protects environment because it it saves fuelwood. It also helps maintain good health as women don't cough/sneeze now while cooking. Overall they were satisfies by the project activities. No negative comments were received during the stakeholder consultation process.

E.3. Report on consideration of comments received

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The comment received made by the stakeholders regarding project was already considered by the project design team and therefore no modifications in the project was required.

Appendix 1. Contact information of project participants

Organization name	Good Farmland Management Kenya, LTD
Registration number with relevant authority	
Street/P.O. Box	Off Lenana Road
Building	Kims Court along Theta lane,
City	Nairobi
State/Region	Nairobi
Postcode	NA
Country	Kenya
Telephone	+254 715 970 131
Fax	NA
E-mail	esther@sistemabiobolsa.com
Website	NA
Contact person	Esther Altorfer
Title	COO & Kenya Country Director
Salutation	NA
Last name	Altorfer
Middle name	NA
First name	Esther
Department	NA
Mobile	+33(7) 81 45 30 07
Direct fax	NA
Direct tel.	NA
Personal e-mail	NA

Organization name	Swiss Carbon Value Ltd.
Registration number with relevant authority	
Street/P.O. Box	Technoparkstrasse 1
Building	NA
City	Zurich
State/Region	Switzerland
Postcode	NA
Country	Switzerland
Telephone	NA
Fax	NA
E-mail	registration@southpole.com
Website	www.southpole.com
Contact person	Renat Heuberger
Title	CEO
Salutation	Mr.
Last name	Heuberger
Middle name	NA
First name	Renat

Department	NA
Mobile	NA
Direct fax	NA
Direct tel.	NA
Personal e-mail	NA

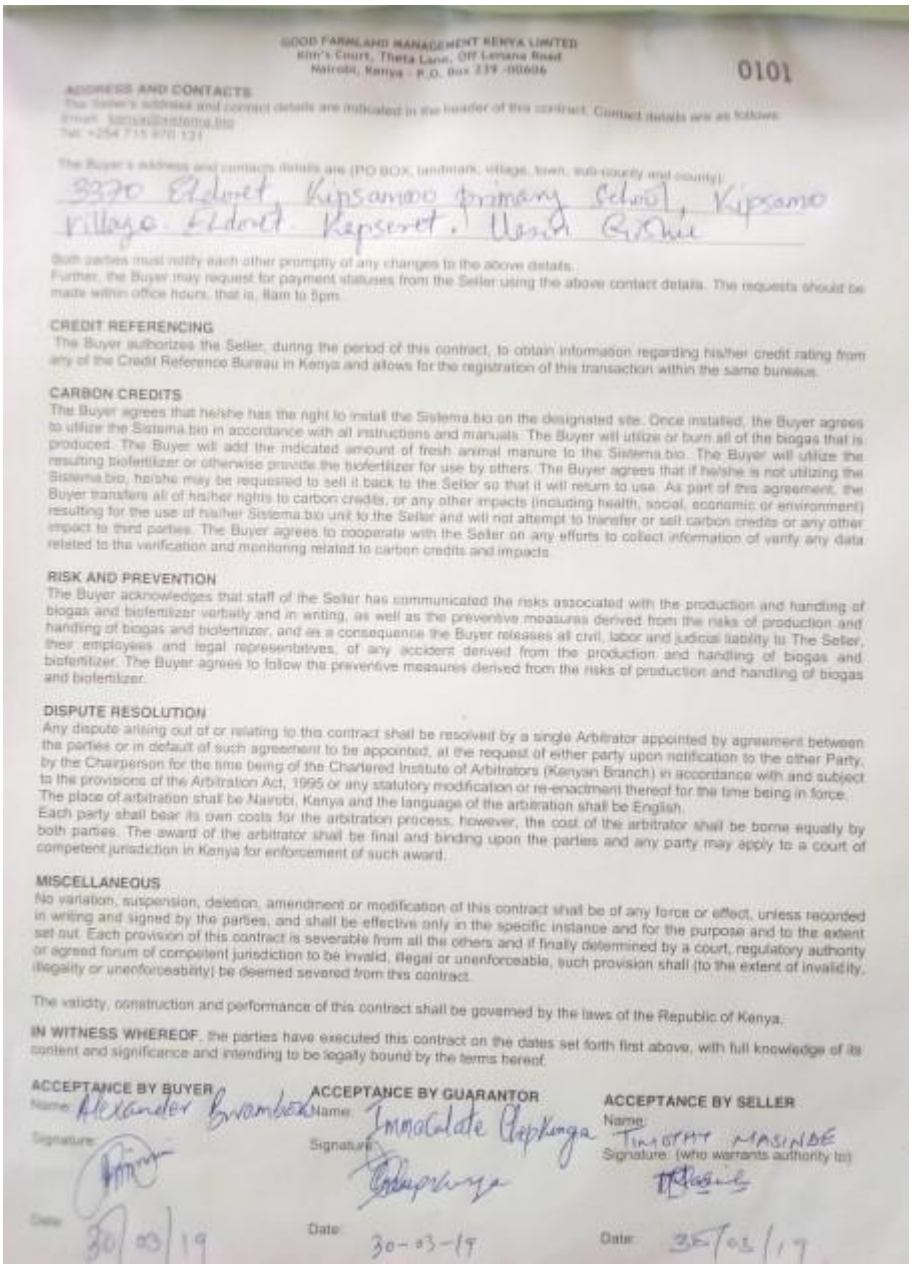
Appendix 2. Summary of post registration design changes

Not Applicable

Revision History

Version	Date	Remarks
1.1	24 August 2017	Updated to include section A.8 on 'gender sensitive' requirements
1	10 July 2017	Initial adoption

Appendix 3. Sample Copy of agreement with the end users



GOOD FARMLAND MANAGEMENT KENYA LIMITED
Kim's Court, Theta Lane, Off Lenana Road
Nairobi, Kenya - P.O. Box 239 -00606

0101

ADDRESS AND CONTACTS
The Seller's address and contact details are indicated in the header of this contract. Contact details are as follows:
Email: kenya@sistema.bio
Tel: +254 715 970 131

The Buyer's address and contacts details are (PO BOX, landmark, village, town, sub-county and county):
9370 Eldoret, Kipsamoo primary School, Kipsamo village. Eldoret Kapseret. Uasin Gishu

Both parties must notify each other promptly of any changes to the above details.
Further, the Buyer may request for payment statuses from the Seller using the above contact details. The requests should be made within office hours, that is, 8am to 5pm.

CREDIT REFERENCING
The Buyer authorizes the Seller, during the period of this contract, to obtain information regarding his/her credit rating from any of the Credit Reference Bureau in Kenya and allows for the registration of this transaction within the same bureaus.

CARBON CREDITS
The Buyer agrees that he/she has the right to install the Sistema.bio on the designated site. Once installed, the Buyer agrees to utilize the Sistema.bio in accordance with all instructions and manuals. The Buyer will utilize or burn all of the biogas that is produced. The Buyer will add the indicated amount of fresh animal manure to the Sistema.bio. The Buyer will utilize the resulting biofertilizer or otherwise provide the biofertilizer for use by others. The Buyer agrees that if he/she is not utilizing the Sistema.bio, he/she may be requested to sell it back to the Seller so that it will return to use. As part of this agreement, the Buyer transfers all of his/her rights to carbon credits, or any other impacts (including health, social, economic or environment) resulting for the use of his/her Sistema.bio unit to the Seller and will not attempt to transfer or sell carbon credits or any other impact to third parties. The Buyer agrees to cooperate with the Seller on any efforts to collect information of verify any data related to the verification and monitoring related to carbon credits and impacts.

RISK AND PREVENTION
The Buyer acknowledges that staff of the Seller has communicated the risks associated with the production and handling of biogas and biofertilizer verbally and in writing, as well as the preventive measures derived from the risks of production and handling of biogas and biofertilizer, and as a consequence the Buyer releases all civil, labor and judicial liability to The Seller, their employees and legal representatives, of any accident derived from the production and handling of biogas and biofertilizer. The Buyer agrees to follow the preventive measures derived from the risks of production and handling of biogas and biofertilizer.

DISPUTE RESOLUTION
Any dispute arising out of or relating to this contract shall be resolved by a single Arbitrator appointed by agreement between the parties or in default of such agreement to be appointed, at the request of either party upon notification to the other Party, by the Chairperson for the time being of the Chartered Institute of Arbitrators (Kenyan Branch) in accordance with and subject to the provisions of the Arbitration Act, 1995 or any statutory modification or re-enactment thereof for the time being in force.
The place of arbitration shall be Nairobi, Kenya and the language of the arbitration shall be English.
Each party shall bear its own costs for the arbitration process, however, the cost of the arbitrator shall be borne equally by both parties. The award of the arbitrator shall be final and binding upon the parties and any party may apply to a court of competent jurisdiction in Kenya for enforcement of such award.

MISCELLANEOUS
No variation, suspension, deletion, amendment or modification of this contract shall be of any force or effect, unless recorded in writing and signed by the parties, and shall be effective only in the specific instance and for the purpose and to the extent set out. Each provision of this contract is severable from all the others and if finally determined by a court, regulatory authority or agreed forum of competent jurisdiction to be invalid, illegal or unenforceable, such provision shall (to the extent of invalidity, illegality or unenforceability) be deemed severed from this contract.

The validity, construction and performance of this contract shall be governed by the laws of the Republic of Kenya.

IN WITNESS WHEREOF, the parties have executed this contract on the dates set forth first above, with full knowledge of its content and significance and intending to be legally bound by the terms hereof.

ACCEPTANCE BY BUYER	ACCEPTANCE BY GUARANTOR	ACCEPTANCE BY SELLER
Name: Alexander Bvumbeka	Name: Immaculate Chepkonga	Name: TIMOTHY MASINDE
Signature:	Signature:	Signature: (who warrants authority to)
Date: 30/03/19	Date: 30-03-19	Date: 30/03/19

Appendix 4. Calculation of Installed energy output for the proposed project at plant and project level.

Capacity (m3)	6	8	12	16	20	30	40	Total
Year 1	385	303	193	63	99	24	59	1,126
Year 2	837	899	620	186	372		186	3,100
Year 3	2,100	3,100	2,200	600	1,300		700	10,000
Year 4	3,000	6,600	4,800	1,200	2,800		1,600	20,000
Year 5	4,500	17,500	13,000	3,000	7,500		4,500	50,000
Total	**10,822**	**28,402**	**20,813**	**5,049**	**12,071**	**24**	**7,045**	**84,226**

Activity Data	Value	Unit	Ref
Combustion efficiency of burners (η)	40.32%	Percentage	Client Survey
H_b = heat of combustion per unit volume of biogas	21.5	MJ/m3	Default value as per AMS-I.I
V_b = Volume of the biogas	1146628	m3/day	Calculated
Energy available from all biodigesters	9939889	MJ/day	Calculated
Energy available from all biodigesters	2761080	kWh/day	Calculated
Thermal energy available from all biodigesters	690270	kW thermal Capacity	Calculated
Thermal energy available from all biodigesters	690.27	MW, thermal	Calculated
Thermal Energy available per unit	8.20	kW, thermal	Calculated

Appendix 5. Evidence for Start Date of the Project

GOOD FARMLAND MANAGEMENT KENYA LIMITED

P.O BOX 2391 - 00606
SARIT CENTRE, NAIROBI. KENYA

PAY BILL NO: 947938

Invoice

Company VAT Reg.	Tax Date	Invoice No
P051649592D	07/12/2018	1232

Invoice To
Recho Mutai

Terms	Rep	Ship Date	Ship Via	Project

Qty	Item	Description	Rate	Amount	VAT
1	New-BB6		77,900.00	77,900.00	Non

VAT Summary

Rate	KES VAT	KES NET
TOTALS	0.00	0.00

Subtotal	KES 77,900.00
VAT Total	KES 0.00
Total	KES 77,900.00

3E5342431346BDF10865AF85F84D034A73227A41 0039 00001255 1812071546 AD7000972