

Gold standard for the global goals Monitoring report



June 2017, version 1

Title of the project	Arakalagudu Biodigester Project II
Gold Standard project id	GS 817
Version number of the monitoring report	3
Completion date of the monitoring report	01/12/2020
Date of project design certification	18/02/2011
Start date of crediting period	01/02/2010
Duration of this monitoring period	(01/01/2018) to (31/01/2020)
Duration of previous monitoring period	(01/01/2017) to (31/12/2017)
Project representative(s)	GoodPlanet Foundation
Host Country	India
Certification pathway (activity certification/impact certification)	Impact certification
SDG Contributions targeted (as per approved PDD)	SDG 1 – No poverty SDG 7 – Affordable and clean energy SDG 13 – Climate Action
Gold Standard statement/product certification sought (GSVER/ADALYs/RECs etc.)	GS VER
Selected methodology(ies)	Indicative programme, baseline, and monitoring methodology for Small Scale Biodigester, Voluntary Gold Standard, Version 1.
Estimated amount of annual average certified SDG impact (as per approved PDD)	SDG 1 – 755 project households (estimated) SDG 7 – 755 project households (estimated) SDG 13 – 4674 tCO ₂ /year
Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period	<p><u>2018: (01/01/2018 to 31/12/2018)</u></p> <ul style="list-style-type: none"> • SDG 1 – 574 project households • SDG 7 – 574 project households • SDG 13 – 3245 tCO₂ <p><u>2019: (01/01/2019 to 31/12/2019)</u></p> <ul style="list-style-type: none"> • SDG 1 – 517 project households • SDG 7 – 517 project households • SDG 13 – 2920 tCO₂ <p><u>2020: (01/01/2020 to 31/01/2020)</u></p> <ul style="list-style-type: none"> • SDG 1 – 465 project households • SDG 7 – 465 project households • SDG 13 – 219 tCO₂

SECTION A. Description of project

A.1. Purpose and general description of project

The project activity aim is to provide a sustainable solution for daily cooking needs of the beneficiaries by providing biogas plants and vermicomposting units in the villages of Arakalagudu Taluk, Karnataka state, India. The project has been funded by GoodPlanet Fondation and was implemented along with its project partner SKG Sangha. The project aimed to completely replace the use of firewood by the biogas units for daily cooking needs. The SKGS team has carried out the monitoring of the project with regular visits to the units during the year. To avoid any double counting of the biogas plants during the monitoring survey, each plant has been provided with a unique identification number. A total of 755 biogas and vermicomposting units have been constructed. The 755 biogas units were installed in different phases. In the year, 2010 a total of 505 units were installed and functioning. The remaining 250 units were installed and functioning in the year 2011. The complete list of 755 beneficiaries with the commissioning date of each installed biogas unit has been provided to the Gold Standard.

The biodigester model constructed in the project activity is the fixed dome also popularly known as the “Deenbhandhu model” in India. The capacity of each biodigester installed in the project activity is 2m³ of biogas per day. The available animal-dung is utilised in the biodigester, which otherwise would have been dumped in the traditional open compost pit to decay and leading to methane emissions. The biogas generated from the digester is used for the daily cooking needs of the families in the project activity. The project also replaces the use of firewood, which have been one of the causes for the respiratory problems both for the women and the children of the household. The slurry from the biodigester is further treated into the vermicompost unit to generate organic manure. The emission reductions from the vermicompost units have not been taken into account in this project activity. The project was registered with the Gold Standard Foundation on the 18th February 2011. GHG reductions due to the project activity – The biogas project avoids the GHG emissions from the use of the non-renewable firewood use for cooking and the emissions from the animal dung, which was usually dumped in traditional compost pits leading to methane emissions. The use of biogas in the project activity has firstly replaced the firewood for cooking and secondly uses the available animal dung for biogas production rather than directly dumping in the traditional compost pit. A total of 755 units were installed in the project activity.

This monitoring report is for the following period (First and last dates of the monitoring period are inclusive) –

- i) 01/01/2018 to 31/12/2018
- ii) 01/01/2019 to 31/12/2019
- iii) 01/01/2020 to 31/01/2020

A.2. Location of project

Arakalagudu Taluk, Hassan district, Karnataka State

	Co-ordinates.
Longitude	75° 56' 2.86 ''
Latitude	12° 30' 40.71''

A.3. Reference of applied methodology

Indicative programme, baseline, and monitoring methodology for Small Scale Biodigester, Voluntary Gold Standard, Version 1

A.4. Crediting period of project

01/02/2010 to 31/01/2020 (please refer section B.2.3 below)

SECTION B. Implementation of project

B.1. Description of implemented project

A total of 755 biogas and vermicomposting units have been constructed in the project activity. The 755 biogas units were installed during the year 2010 & 2011.

In the year, 2010 a total of 505 units were installed and functioning. The remaining 250 units were installed and functioning in the year 2011.

The complete database with the 755 units and the status of each unit in the present monitoring period has been provided for verification. Please refer the VER's calculation sheet, "SURVEY 2017".

No delays or deviations were observed compared to the details provided in the approved PDD.

There were no FAR's raised during any of the previous issuance reviews for the project activity.

B.2. Post-registration changes

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

No deviations reported in the project activity.

B.2.2. Corrections

No corrections were made to the project information or to the parameters fixed at validation.

B.2.3. Changes to start date of crediting period

The project activity was registered in the month of February 2011 and the start date of the crediting period in the approved PDD is mentioned as 01/04/2010.

Therefore, as a retroactive project, the change in start date of the crediting period to 01/02/2010 was request to GS during the first GS verification audit.

The start date of the crediting period was approved by GS as 01/02/2010 during the first verification of the project activity. Therefore, the end date of the crediting period is 31/01/2020.

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

No changes were made in monitoring plan, applied methodology or baseline. .

B.2.5. Changes to project design of approved project

No changes were made to the project design.

SECTION C. Description of monitoring system applied by the project

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I. Monitoring survey methodology: -

The project monitoring survey has been carried out for both, the sustainable development parameters and the emission reductions parameters.

A complete survey of all the installed units was carried out in 2017, and accordingly the obtained results were reported for verification. . The 2017 survey of all the 755 installed units was an additional cost since it required organizing and mobilizing the project team to all the villages where the biogas units were installed. Therefore, to reduce the monitoring costs, there were no carbon monitoring surveys held in 2018. On the other hand, the regular follow-up with

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the project beneficiaries was continued in 2018 & 2019, as a part of the annual monitoring of the project activity as follows:

- These follow-up visits to the project beneficiaries was carried out by the local supervisor.
- The visits were held at regular interval during the year to check the status of the installed unit.
- The project supervisor reported the field observation on the status of the installed units by providing a quarterly report during the year.
- The project database was accordingly updated.

Therefore, a carbon monitoring was held in 2019 to evaluate the emission reduction savings for the crediting years 2018 and 2019.

The sampling method to select the project households for the monitoring surveys is as follows:-

- Each biogas unit in the project activity has been assigned a unique identification number by SKGS, to avoid double counting during the field surveys.
- The minimum required sample size as per the applied methodology is 60 households. A total of 125 households were randomly selected and surveyed during this monitoring survey.
- The random selection of the 125 households was made using the excel function of 'RAND', which provided a random number to each unit in the project database of 755 households. The first randomly mixed 125 units were selected for the monitoring survey. The list of the randomly selected households is provided for verification.

The survey was carried out by three senior members of the SKGS along with the help of local entities of some villages. The monitoring surveys of the 125 households were held from 26th October 2019 to 3rd November 2019.

Apart from staff members, few local representatives appointed by SKGS also participated during these surveys to collect the monitoring data. The SKGS surveying teams have already carried out similar type of monitoring surveys for this project and have improved the methods to collect and record the data with their previous survey experiences.

- To avoid any discrepancies, the GoodPlanet Foundation (GPF) team members randomly checked the monitoring data, by carrying out a field visit to the project units during the month of February 2018 and in November 2019.

The monitoring surveys were carried out by experienced SKGS team, who had participated in the previous carbon surveys. Therefore, no training programs were required for the survey team members.

II) GoodPlanet Foundation team visit to the project areas:

A random field visit to the project units was also carried out by the GoodPlanet Foundation team member in the month February 2018 and in November 2019. The units visited were functioning and had not faced any technical issues by any of the beneficiaries. Each beneficiary was asked to demonstrate the working of the biogas units and some of the beneficiaries were requested to demonstrate the feeding procedure of animal dung into the biodigester. These demonstrations also assured that the beneficiaries were well trained about the required quantity of animal dung and water that is needed for a regular supply of the biogas.

The following were few of the points discussed with each of the beneficiaries during this visit:

- a) The benefits of the project in terms of both the sustainable and economic aspects.
- b) The process of making the compost and the total quantity of compost they have produced.
- c) The use of firewood/and or Kerosene both baseline and project scenarios.
- d) The change in income of the beneficiary including women empowerment due to the additional income like – who decided to have the biogas unit, the contribution of the woman in making the decision, time saving due to the project etc.

A discussion was also held with the SKGS local supervisor (the staff in-charge of continuous monitoring of the units in his purview of the project areas. These field assessments by the GoodPlanet team also gave a better understanding of the actual status of the biogas units.

SECTION D. Data and parameters

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

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

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	NCV _{firewood}
Unit	TJ/Gg
Description	Net calorific value of wood
Source of data	IPCC Guidelines 2006 – Vol:2 Energy, chapter 1, page 1.19-Table1.2
Value(s) applied)	15.6
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	NCV _{kerosene}
Unit	TJ/Gg
Description	Net calorific value of Kerosene.
Source of data	IPCC Guidelines 2006 – Vol:2 Energy, chapter 1, page 1.18-Table1.2
Value(s) applied)	43.8
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	EF _{CO₂}
Unit	tCO ₂ /GJ
Description	CO ₂ emission factor per unit of energy of firewood.
Source of data	IPCC Guidelines 2006 – Vol:2 Energy, chapter 1, page 1.24 -Table1.4
Value(s) applied)	112
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	EF _{CO₂,i}
Unit	tCO ₂ /GJ
Description	CO ₂ emission factor of Kerosene

Source of data	IPCC Guidelines 2006 – Vol:2 Energy, chapter 1, page 1.23 -Table1.4
Value(s) applied)	71.9
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	GWP _{CH₄}
Unit	-
Description	Global warming potential of CH ₄
Source of data	IPCC default value
Value(s) applied)	25
Choice of data or measurement methods and procedures	As per the guidelines provided in the GS methodology
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	NRB
Unit	%
Description	Non-renewable biomass
Source of data	Calculated – reference registered PDD (Annex 2)
Value(s) applied)	53.90%
Choice of data or measurement methods and procedures	As per the guidelines provided in the GS methodology
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	PL
Unit	%
Description	Physical leakage of the biodigester
Source of data	Default values of 2006 IPCC Guidelines for National Greenhouse Gas Inventories is 10%
Value(s) applied)	10
Choice of data or measurement methods and procedures	As per the guidelines provided in the GS methodology
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	VS _(Dairy cow)
Unit	kg dry matter animal-1 day-1
Description	daily volatile solid excreted for livestock category T
Source of data	Biogas Technology – B T Nijaguna.
Value(s) applied)	3.8
Choice of data or measurement methods and procedures	As per the locally available reference.
Purpose of data	Emission reduction calculations
Additional comments	365 = basis for calculating annual VS production, days yr-1

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	VS _(Buffalo)
Unit	kg dry matter animal-1 day-1
Description	daily volatile solid excreted for livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	3.1
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	365 = basis for calculating annual VS production, days yr-1

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	VS _(Other cattle)
Unit	kg dry matter animal-1 day-1
Description	daily volatile solid excreted for livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	1.4
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	365 = basis for calculating annual VS production, days yr-1

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	Bo _(Dairy Cow)
Unit	m ³ CH ₄ kg-1 of VS excreted

Description	maximum methane producing capacity for manure produced by livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	0.13
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	B ₀ (Buffalo)
Unit	m ³ CH ₄ kg ⁻¹ of VS excreted
Description	maximum methane producing capacity for manure produced by livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	0.10
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	B ₀ (Other Cattle)
Unit	m ³ CH ₄ kg ⁻¹ of VS excreted
Description	maximum methane producing capacity for manure produced by livestock category T
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	0.10
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	MCF _(Solid Storage)
Unit	[-] %
Description	methane conversion factors for each manure management system S by climate region k
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	4

Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	MCF _(slurry with crust)
Unit	[-] %
Description	methane conversion factors for each manure management system S by climate region k
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	37
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	MCF _(slurry w/o crust)
Unit	[-] %
Description	methane conversion factors for each manure management system S by climate region k
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	60
Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	$\eta_{\text{biogastove}}$
Unit	[-] %
Description	Incineration efficiency of the biogas stove
Source of data	default value as per the methodology
Value(s) applied	98

Choice of data or measurement methods and procedures	As per the guidelines provided in the applied methodology.
Purpose of data	Emission reduction calculations
Additional comments	

D.2. Data and parameters monitored

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

Relevant SDG Indicator	SDG13: tCO ₂ e _q reduced by the project activity
Data/parameter:	ID5 / n _{hh,y}
Unit	Number of households
Description	Total number of households participating in the programme year y.
Measured/calculated/default	Calculated
Source of data	Project Database
Value(s) of monitored parameter	01/01/2018 to 31/12/2018 – 574 households 01/01/2019 to 31/12/2019 – 517 households 01/01/2020 to 31/01/2020 – 465 households
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	All households' details with their allocated serial numbers are included in a database maintained by SKGS. The total number of households is derived from this database.
QA/QC procedures:	Each household of the project activity has been allocated a separate serial number to avoid any double counting. The complete list of the details of each household in the monitoring survey has been provided for further verification.
Purpose of data:	Emission reduction calculation
Additional comments:	The GoodPlanet team has also cross-checked this 'detailed list' during the field visits to the units. The allocated identification number to each household was also cross-checked and there have been no repetitions of any numbers allocated to the units. This total number of households was established based two surveys as follows: i) All the households (i.e 755 units) were visited in 2017 to check the status of each installed unit. The 2017 has been provided, Please refer to ER calculation sheet "Updated Project Database" cell D767 & D768. ii) In the 2019 monitoring survey, we had randomly selected 125 hh out of the total 716 installed units, which included both - functioning and non-functioning units. Please refer the sheet, "Recap Survey", column I. Therefore, the usage rate is not considered based on the 2019 monitoring survey as it already includes non-functioning units. The aim to include the non-functioning units was also to recheck if any of the households who had stopped using biogas units in the year 2017 had restarted and/or switched to biogas for cooking during the year 2019. As per the 2019 survey, it is clear that none of the households who had stopped using the biogas in 2017 had switched back to biogas. As a conservative approach, 10% drop of rate for each crediting year has been taken into account. Please refer the sheet, "Updated Project Database" cell D775 & E775.

Relevant SDG Indicator	SDG13: tCO ₂ e _q reduced by the project activity
Data/parameter:	ID 8 / F _{i,y, pi}
Unit	kg or m ³

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Description	amount of fuel I consumption in the project in year y
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	0
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	During the survey, the monitoring team will ask each beneficiary in the survey sample about the average fuel consumed per day after the implementation of the project activity. This will be further calculated for the annual consumption.
QA/QC procedures:	To assure that the beneficiary gives a correct data, the monitoring team weighed the firewood using the weighing machine, to record the accurate data.
Purpose of data:	Emission reduction calculations
Additional comments:	All surveyed beneficiaries had a continuous supply of biogas throughout the monitoring year. The emission reductions of the firewood use have been taken into account while calculating total VER's but no household used firewood for cooking during the monitoring period. Please refer to ER calculation sheet "Project Emissions" column L & M

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	ID 11 / MS _(T,biodigester,k)
Unit	[-] %
Description	Fraction of livestock category T's manure fed into the biodigester, S in climate region k
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	59%
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	It is calculated by the total amount of cow dung that is collected by the beneficiary and fed into the biodigester. The fraction of manure for each category of the animal has been calculated depending on the time it spends in the sheds.
QA/QC procedures:	The GoodPlanet team rechecked all the monitoring data and the excel sheets to be reassured that all the values corresponded to the revised documents.
Purpose of data:	Emission Reduction Calculations
Additional comments:	The data was cross-checked by the GoodPlanet team. Please Refer to ER calculation sheet "Project Emissions" cell K7

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	ID 13 / LC
Unit	[-]Average number of livestock of category – Dairy Cow
Description	Number of life stock of category K
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	4

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Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Average
QA/QC procedures:	The GoodPlanet team crosschecked the data. The data was collected by the SKG team members, who have a more than several years of experience to collect the monitoring data for this project activity.
Purpose of data:	Emission Reduction Calculations
Additional comments:	Please Refer to ER calculation sheet "MS Survey 2019" cell AF132

Relevant SDG Indicator	SDG13: tCO2eq reduced by the project activity
Data/parameter:	ID 13 / LC
Unit	[-]Average number of livestock of category – Buffalo
Description	Number of life stock of category K
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	0
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Average
QA/QC procedures:	The GoodPlanet team crosschecked the data. The data was collected by the SKG team members, who have a more than several years of experience to collect the monitoring data for this project activity.
Purpose of data:	Emission Reduction Calculations
Additional comments:	Please Refer to ER calculation sheet "MS Survey 2019" cell AI132

Relevant SDG Indicator	SDG13: tCO2eq reduced by the project activity
Data/parameter:	ID 13 / LC
Unit	[-]Average number of livestock of category – Other Cattle
Description	Number of life stock of category K
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	1
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Average
QA/QC procedures:	The GoodPlanet team crosschecked the data. The data was collected by the SKG team members, who have a more than several years of experience to collect the monitoring data for this project activity.
Purpose of data:	Emission reduction calculations.
Additional comments:	Please Refer to ER calculation sheet "MS Survey 2019" cell AI132

Relevant SDG Indicator	SDG13: tCO ₂ eq reduced by the project activity
Data/parameter:	ID 17 / MS _{S,T,h,p}
Unit	%
Description	Fraction of livestock category T's manure not fed into the biodigester and treated according to the animal waste management S.
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	17%
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	This parameter is measured by asking each beneficiary the total amount of animal dung collected from the sheds (number of baskets), if any additional quantity of dung left after feeding the digester is either pre-treated or directly dumped into the traditional composting pits. The fraction of dung that is not pre-treated aerobically and dumped in pits has been accounted in the project emissions calculation.
QA/QC procedures:	To assure the quality of the data, two SKGS senior staff members who have been trained have carried out the monitoring survey. The data was cross checked by the GoodPlanet team who also carried out a random visit to the units of the project activity to ensure that the data provided corresponds to the field observations made by the GoodPlanet team.
Purpose of data:	Emission Reduction Calculations
Additional comments:	Please Refer to ER calculation sheet "Project Emissions" cell F6

Relevant SDG Indicator	SDG 1: End poverty in all its forms everywhere - Proportion of population living in households with access to basic services
Data/parameter:	Number of households using biogas for cooking
Unit	%
Description	The project activity will provide the proportion of the project population living in households with access to biogas (clean and renewable energy for cooking needs)
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	01/01/2018 to 31/12/2018 – 574 households 01/01/2019 to 31/12/2019 – 517 households 01/01/2020 to 31/01/2020 – 465 households
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	The access to clean and renewable energy services to the beneficiaries in the project area is monitored by evaluating the total number of households having access to continuous supply of the biogas for daily cooking needs. This indicator is being assessed on three different scenarios. First, on the supply of biogas. Secondly, if they have stopped using firewood and kerosene for the daily cooking needs, and thirdly if they had any technical issues with the biogas units.
QA/QC procedures:	The monitoring surveys are carried out by the SKGS team members and the data is evaluated by the project manager. The data is also cross-checked by the GoodPlanet team members and a field visit is organised to check the monitored households.
Purpose of data:	SDG evaluation

Additional comments:	As a conservative approach, a 10% drop of rate has been applied to each monitoring year. Hence ,the number of Households with functioning biogas unit for the years 2018, 2019 and January 2020 is conservative. Please Refer to ER calculation sheet “Updated Project Database” cells D777, E777 & F777.
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Relevant SDG Indicator	SDG 7: By 2030, ensure universal access to affordable, reliable and modern energy services - Proportion of population with primary reliance on clean fuels and technology
Data/parameter:	Number of households
Unit	%
Description	The project activity will provide the total number of beneficiaries of the project activity, who will have continuous access to biogas and will use the biogas slurry as an organic compost for agriculture
Measured/calculated/default	Calculated
Source of data	Monitoring survey
Value(s) of monitored parameter	01/01/2018 to 31/12/2018 – 574 households 01/01/2019 to 31/12/2019 – 517 households 01/01/2020 to 31/01/2020 – 465 households
Monitoring equipment	-
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	This indicator is being assessed on two different scenarios. First, on the continuous availability of biogas for daily cooking needs. Moreover, if the units were repaired in case if they had any technical issues with the biogas units.
QA/QC procedures:	The SKGS team regularly follow-up with the project beneficiary to ensure the good working condition of each installed biogas unit. The annual monitoring surveys are also carried out by the SKGS team members to check the functioning of the units. The collected data is evaluated by the SKGS project manager. The data is also cross-checked by the GoodPlanet team members and a field visit is organised to check the monitored households.
Purpose of data:	SDG evaluation
Additional comments:	As a conservative approach, a 10% drop of rate has been applied to each monitoring year. Hence ,the number of Households with functioning biogas unit for the years 2018, 2019 and January 2020 is conservative. Please Refer to ER calculation sheet “Updated Project Database” cells D777, E777 & F777.

D.3. Implementation of sampling plan

The monitoring survey was carried out for a selected sample of the total population of the project activity. The selection of the households to be monitored during each year was carried out on a random basis in the project area.

Also, to avoid any double counting each household of the project activity, each unit in the project has been allocated a unique identification number. The complete list of the details of each household in the monitoring survey has been provided.

SECTION E. Calculation of SDG outcomes

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

- **SDG 1 : No poverty**

From the baseline survey it is observed that none of the project beneficiaries have access to clean and affordable form of energy to meet their daily cooking needs. The aim of the project outcome is to provide a biogas unit to each family participating the project activity.

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Therefore, the baseline value of the SDG1 is considered to be “zero” number of project households using biogas for cooking.

- **SDG 7 : Affordable and clean Energy**

In the baseline scenario, most of the target beneficiaries are dependent on firewood for cooking. Very few families can afford to buy LPG due to its high costs and the time taken to go and collect it from the nearest city centre. The biogas units will be owned by the households and will be free, sustainable and renewable form of energy for meeting their daily cooking needs. Therefore, the baseline value of the SDG7 is considered to be “zero” number of project households having access to biogas for cooking.

- **SDG 13 : Climate action**

Formulae used to estimate baseline emissions:

As per the GS small-scale biodigester methodology, the baseline emissions involve emission from use of fossil fuel and non-renewable biomass for cooking and heating, and emissions from the handling of animal waste in the baseline situation.

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

$$(i) \quad BE_h = BE_{th,h} + BE_{aw,h}$$

Where:

BE_h = Baseline emissions of household h (tCO_{2e}/yr)

$BE_{th,h}$ = Baseline emissions from fuel consumption for thermal energy needs of household h (tCO_{2e}/yr)

$BE_{aw,h}$ = Baseline emissions from animal waste handling of household h (tCO_{2e}/yr)

Baseline emissions from fuel consumption for thermal energy needs of household h.

The baseline estimation from fuel consumption is calculated as per the below mentioned formulae and is adjusted for the share of non-renewable biomass. The non-renewable biomass for the project has been carried out as mentioned in the GS methodology. The Fossil fuel and biomass use has been determined through a survey in sample of the total population and the survey has been carried out before the implementation of the biodigesters for each beneficiaries. The calculation of baseline emissions is based on the results of the questionnaire. After collecting the questionnaires at all households included in the sample group, the mean and standard deviation of household project CO₂ emissions from fuel consumption should be calculated. These variables will be inputs for calculating total CO₂ emission from fuel consumption for the total number of households in the baseline situation as per formulas:

$$BE_{th,h,option1} = \sum (F_{i,bl,h}) \cdot NCV_i \cdot EF_{CO2i}$$

Where:

$BE_{th,h}$ = The baseline emissions used to meet the thermal energy need of one household

$F_{i,bl,h}$ = The total amount of fuel i in the baseline situation (mass or volume) of one household

NCV_i = The net calorific value (energy content) per mass or volume unit of a fuel i,

$EF_{CO2,i}$ = The CO₂ emission factor per unit of energy of the fuel i.

The mean of the household baseline CO₂ emissions is calculated as follows:-

$$\mu BE = \frac{\sum BE_h}{n_{bl}}$$

Where:

μBE = Mean of CO₂ emission of households included in the baseline sample group

BE_h = The amount of CO₂ emission in household h included in the baseline sample group in the baseline situation

n_{bl} = Total number of households included in the baseline sample group

The mean of the household baseline CO₂ emissions is: 5.83 tCO₂ / year

The standard deviation of CO2 emission in the baseline situation is calculated as follows:

$$\sigma_{BE,th} = \sqrt{\frac{\sum (BE_{th,h} - \mu_{BE,th})^2}{n_{bl} - 1}}$$

Where:

- $\sigma_{BE,th}$ = Standard deviation of CO2 emission in the baseline situation
- $\mu_{BE,th}$ = Mean of CO2 emission of households included in the baseline sample group
- $BE_{th,h}$ = The amount of CO2 emission in household h included in the baseline sample group in the baseline situation
- n_{bl} = Total number of households included in the baseline sample group

The standard deviation of CO2 emission in the baseline situation is: 2.64

The total CO2 emission in the pre-project situation can then be calculated as follows:

$$BE = n_{hh,y} \left(\mu_{BE} - z \cdot \frac{\sigma_{BE}}{\sqrt{n_{bl}}} \right)$$

Where:

- BE = The total amount of CO2 emission in the pre-project situation
- $n_{hh,y}$ = Total number of households participating in the program for the monitoring interval y
- σ_{BE} = Standard deviation of CO2 emission in the baseline situation
- μ_{BE} = Mean of CO2 emission of households included in the baseline sample group
- n_{bl} = Total number of households included in the baseline sample group
- z = Standard normal for a confidence level of 95% (1.96)

Baseline emissions from handling of animal waste:

The baseline emissions, from animal waste handling have been estimated using the IPCC TIER 2 approach (households with distinctive animal waste management systems where animals are kept in a confined area and the manure is collected following a specifically designed system). The formulae are:

$$BE_{aw,h,T2} = \sum_T (EF_{(T)} \cdot LC_{T,h})$$

Where:

- $BE_{aw,h,T2}$ = the baseline emission from handling of animal waste for household h for TIER 2 in tCO2 per year
- $LC_{T,h}$ = Number of animals of livestock category T in household h

$$EF_{(T)} = VS_{(T)} \cdot 365 \cdot GWP_{CH4} \left[Bo_{(T)} \cdot 0.67 \text{ kg} / \text{m}^3 \cdot \sum_k \frac{MCF_{BL,k}}{100} \cdot MS_{(T,k)} \right]$$

Where:

- $EF_{(T)}$ = annual CH4 emission factor for livestock category T, tCO2eq animal-1 yr-1
- $VS_{(T)}$ = daily volatile solid excreted for livestock category T, kg dry matter animal-1 day-1
- 365 = basis for calculating annual VS production, days yr-1
- GWP_{CH4} = Global Warming Potential (GWP) of methane
- $Bo_{(T)}$ = maximum methane producing capacity for manure produced by livestock category T, m3CH4 kg-1 of VS excreted
- 0.00067 = conversion factor of m3 CH4 to tonne CH4
- $MCF_{(BL,k)}$ = 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 the animal waste management system, in climate region k, dimensionless

From the above mentioned method, the baseline emissions per household are as follows:

Baseline emissions from fuel consumption for thermal energy needs of household h (tCO _{2e} /yr/HH)	3.34 tCO ₂ /yr
Baseline emissions from animal waste handling of household h (tCO _{2e} /yr/HH)	3.46 tCO ₂ /yr
Total baseline emissions (tCO ₂ /year/HH)	6.80 tCO ₂ /yr
Baseline emissions for monitoring year 2018 (1st Jan'2018 to 31st Dec'2018)	3905 tCO ₂
Baseline emissions for monitoring year 2019 (1st Jan'2019 to 31st Dec'2019)	3514 tCO ₂
Baseline emissions for monitoring year 2020 (1st Jan'2020 to 31st Jan'2020)	264 tCO ₂

Please refer the ER calculation sheet, "Total Emission reductions" – cells B29, B30 and B31.

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

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

- **SDG 1 : No poverty**

The SDG1 project outcome will be calculated based on the total number of surveyed beneficiaries of the project activity who declare during each monitoring survey that they have a 'continuous & free' access to biogas for daily cooking.

From the monitoring survey results for the SDG1:

In 2018 - 574 households had a 'continuous & free' access to biogas for daily cooking.

In 2019 – 517 households had a 'continuous & free' access to biogas for daily cooking.

In 2020 – 465 households had a 'continuous & free' access to biogas for daily cooking.

- **SDG 7 : Affordable and clean Energy**

The SDG7 project outcome will be calculated based on the total number of beneficiaries of the project activity who have a continuous access to biogas (renewable & clean energy) for daily cooking.

From the monitoring survey results for the SDG 7:

In 2018 - 574 households had a continuous access to biogas (renewable & clean energy) for daily cooking.

In 2019 – 517 households had a continuous access to biogas (renewable & clean energy) for daily cooking.

In 2020 - 465 households had a continuous access to biogas (renewable & clean energy) for daily cooking.

- **SDG 13 : Climate action**

Formulae used to estimate project emissions:

The formula used to estimate the project estimations is as defined in the GS Small scale Biodigester methodology. The project emissions involve emission from household fuel consumption after installation of the biodigester and emission from the biodigester in the statistically significant sampling group. Emission from the biodigester includes physical leakage of the biodigester and incomplete combustion of biogas, which are both calculated as percentage of the produced methane.

$$PE_{y,h} = PE_{th,h,y} + PE_{biodigester,h,y}$$

Where:

$PE_{y,h}$ = Project emissions per household h in year y (tCO_{2e}/yr).

$PE_{th,h,y}$ = Project emissions from fuels used to meet the thermal energy need per household h in year y (tCO_{2e}/yr).

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$PE_{\text{biodigester},h,y}$ = Project emission from the biodigester per household h in year y (tCO₂e/yr).

$$PE_{h,h,y} = \sum ((F_{i,p_i,y}) \cdot NCV_i \cdot EFCO_{2,i})$$

Where:

$PE_{\text{th},h,y}$ = Project emissions from fuels used to meet the thermal energy need per household h in year y (tCO₂e/yr).

$F_{i,p_i,y}$ = The total amount of fuel i in the project situation (mass or volume) per household in year y

NCV_i = The net calorific value (energy content) per mass or volume unit of a fuel i ,

$EFCO_{2,i}$ = The CO₂ emission factor per unit of energy of the fuel i .

For the assessment of $EFCO_{2,i}$ for $F_{i,p_i,y}$ where $F_{i,p_i,y}$ is a biomass source, the assessment of non-renewable biomass (NRB), as elaborated in the section on baseline emissions will be applied.

$$PE_{\text{biodigester},y} = \sum (LC_{T,h,y} \cdot EF_T) \cdot PL_y + \sum (LC_{T,h,y} \cdot EF_T) \cdot (1 - \eta_{\text{biogastove}})(1 - PL_y)$$

$LC_{T,h,y}$ = Number of animals of livestock category T in year y in household h

EF_T = Annual CH₄ emission factor for livestock category T , (tCH₄/animal/year)

PL = Physical Leakage of the biodigester in year y (%).

$\eta_{\text{biogastove}}$ = Combustion efficiency of the most commonly used type of biogas stove.

EFT is estimated using the IPCC TIER 2 approach as below: -

$$EF_{(T)} = VS_{(T)} \cdot 365 \cdot GWP_{CH_4} \left[Bo_{(T)} \cdot 0.67 \text{kg} / \text{m}^3 \cdot \sum_k \frac{MCF_{BL,k}}{100} \cdot MS_{(T,k)} \right]$$

Where:

$EF_{(T)}$ = annual CH₄ emission factor for livestock category T , tCO₂eq animal⁻¹ yr⁻¹

$VS_{(T)}$ = daily volatile solid excreted for livestock category T , kg dry matter animal⁻¹ day⁻¹

365 = basis for calculating annual VS production, days yr⁻¹

GWP_{CH_4} = Global Warming Potential (GWP) of methane

$Bo_{(T)}$ = maximum methane producing capacity for manure produced by livestock category T , m³CH₄ kg⁻¹ of VS excreted

0.00067 = conversion factor of m³ CH₄ to tonne CH₄

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

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

The physical leakage of 10% from the biodigester has been considered using the IPCC guidelines. Apart from the direct physical from the plant, the incomplete combustion of methane in the biogas stoves has been taken 98 % (default value as per the methodology).

Project emissions will be determined for each household in the sample group. The mean of household project CO₂ emission is calculated as follows:

$$\mu PE = \frac{\sum PE_h}{n_{pj}}$$

Where

μPE Mean of CO₂ emission of households included in the project sample group.

PE_h The amount of CO₂ emission in household h included in the project sample group in the

n_{pj} Total number of households included in the project sample group.

$$\sigma_{PE} = \sqrt{\frac{\sum (PE_{th} - \mu_{PE})^2}{n_{pj} - 1}}$$

Where:

- σ_{PE} = Standard deviation of CO2 emission in the project situation.
- μ_{PE} = Mean of CO2 emission of households included in the project sample group.
- PE_{th} = The amount of CO2 emission in household h included in the project sample group in the baseline situation.
- n_{pj} = Total number of households included in the project sample group.

$$PE = n_{hh,y} \left(\mu_{PE} + z \cdot \frac{\sigma_{PE}}{\sqrt{n_{pj}}} \right)$$

Where:

- PE = The total amount of CO2 emission in the project situation.
- $n_{hh,y}$ = Total number of households participating in the program for the monitoring interval y.
- $\sigma_{PE,th}$ = Standard deviation of CO2 emission in the project situation.
- μ_{PE} = Mean of CO2 emission of households included in the project sample group.
- n_{bl} = Total number of households included in the project sample group.
- z = Standard normal for a confidence level of 95% (1.96).

From the above mentioned method, the project emissions per household are as follows:

Project emissions for monitoring year 2018 (1st Jan'2018 to 31st Dec'2018)	660 tCO2
Project emissions for monitoring year 2019 (1st Jan'2019 to 31st Dec'2019)	594 tCO2
Project emissions for monitoring year 2020 (1st Jan'2020 to 31st Jan'2020)	45 tCO2

The project emissions results as per the above mentioned steps are provided below in the section E.3 of the monitoring report.

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

- **SDG 1 : No poverty**

The net benefit for SDG1 will be evaluated from the monitoring surveys data on the total number of project households having 'continuous & free' access to biogas for daily cooking.

- **SDG 7 : Affordable and clean Energy**

The net benefit for SDG7 will be evaluated from the monitoring surveys based on the total number of project households having access to biogas (renewable & clean energy) for daily cooking.

The outcomes of the project net benefits for the SDG 1 & SDG 7 for the monitoring period are provided section E.4 of the monitoring report.

- **SDG 13 : Climate action**

For SDG13, the project net benefits were calculated as shown below.

Total Emission reductions are then calculated as follows:

$$ER_y = BE - PE_y$$

Where:

$$ER_y = \text{Emission reduction in total household population in year y (tCO2e/yr)}$$

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BE = Baseline emissions of total household population (tCO₂e/yr)
 PE_y = Project emissions of total household population in year y (tCO₂e/yr)

Calculations for Project Emissions are as follows:

- i. Project emissions from thermal energy needs: From the monitoring surveys it shows that the biogas supply was regular and sufficient for cooking needs. In cases where the biogas units had some technical problems and the families had to use the firewood for cooking till the unit was repaired, the total amount of firewood consumed has been taken into account in the project emissions.
- ii. Project emissions from - i) biodigester and ii) from composting pit (AWMS)
 The parameters used to calculate the project emissions from biodigester and the parameters used to calculate the project emissions from animal wastes management system (AWMS), have been provided in the table below:

Parameters	Value	Unit	Reference source
GWP CH ₄	25	-	IPCC
VS_dairy cow	3.8	Kg/Day	Biogas Technology – B T Nijaguna.
VS_buffaloes	3.1	Kg/Day	IPCC Vol 4, Chapter 10, Table 10A-5
VS_other cattle	1.4	Kg/Day	IPCC Vol 4, Chapter 10, Table 10A-5
Bo_dairy cow	0.13	m ³ CH ₄ / Kg VS	IPCC Vol 4, Chapter 10, Table 10A-4
Bo_buffaloes	0.1	m ³ CH ₄ / Kg VS	IPCC Vol 4, Chapter 10, Table 10A-6
Bo_other cattle	0.1	m ³ CH ₄ / Kg VS	IPCC Vol 4, Chapter 10, Table 10A-5
Physical leakage	10 %	-	IPCC default value: anaerobic digesters
Efficiency of biogas stove	98%	-	Default value as per the methodology
Conversion factor m ³ CH ₄ to tonne CH ₄	0.00067	-	Default value as per the methodology
Parameters for anaerobic digester emissions			
MCF (Anaerobic digester)	100%	-	
MS(T,S,k)(fraction of dung put into the biodigester)	59%	-	Calculated
Emission Factor_dairy cow	1.82	tCO ₂ /animal/yr	Calculated
Emission Factor_buffalo	1.14	tCO ₂ /animal/yr	Calculated
Emission Factor_other cattle	0.52	tCO ₂ /animal/yr	Calculated
Parameters for composting pit emissions			
MCF (Composting pit)	1.5%		Cattle bedding (IPCC;Vol 4;Chap 10; table 10,17)
MS(T,S,k) (fraction not put into the biodigester)	17%	-	Calculated
Emission Factor_dairy cow	0.008	tCO ₂ /animal/yr	Calculated
Emission Factor_buffalo	0.005	tCO ₂ /animal/yr	Calculated
Emission Factor_other cattle	0.002	tCO ₂ /animal/yr	Calculated
NRB	78%		Registered PDD
NCV-Firewood	15,6	TJ/Gg	IPCC
Emission Factor_Wood	112	T/Tj	IPCC
Total number of households in the survey sample	125		Random sampling

From the above-mentioned parameters, the emission reductions were calculated for the project activity and the following table summarises the total emission reductions per year from the project activity:

Monitoring year	Total baseline emissions (tCO ₂)	Total project emissions (tCO ₂)	Total emission reductions per year (tCO ₂)
01/01/2018 to 31/12/2018	3905	660	3245
01/01/2019 to 31/12/2019	3514	594	2920
01/01/2020 to 31/01/2020	264	45	219

Please Refer to ER calculation sheet “Total Emission Reductions”, cells D29, D30 & D31.

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

(01/01/2018) to (31/12/2018)

Item	Baseline estimate	Project estimate	Net benefit
SDG 13	3905 tCO2	660 tCO2	3245 tCO2
SDG 1	0 households with access to biogas for cooking	574 households with access to biogas for cooking	574 households with access to biogas for cooking
SDG 7	0 households with access to clean fuel and technology for daily cooking	574 households with access to clean fuel and technology for daily cooking	574 households with access to clean fuel and technology for daily cooking

(01/01/2019) to (31/12/2019)

Item	Baseline estimate	Project estimate	Net benefit
SDG 13	3514 tCO2	594 tCO2	2920 tCO2
SDG 1	0 households with access to biogas for cooking	517 households with access to biogas for cooking	517 households with access to biogas for cooking
SDG 7	0 households with access to clean fuel and technology for daily cooking	517 households with access to clean fuel and technology for daily cooking	517 households with access to clean fuel and technology for daily cooking

(01/01/2020) to (31/01/2020)

Item	Baseline estimate	Project estimate	Net benefit
SDG 13	264 tCO2	45 tCO2	219 tCO2
SDG 1	0 households with access to biogas for cooking	465 households with access to biogas for cooking	465 households with access to biogas for cooking
SDG 7	0 households with access to clean fuel and technology for daily cooking	465 households with access to clean fuel and technology for daily cooking	465 households with access to clean fuel and technology for daily cooking

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

(01/01/2018) to (31/12/2018)

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 1	755 households with access to biogas for cooking	574 households with access to biogas for cooking
SDG 7	755 households with access to clean fuel and technology for daily cooking	574 households with access to clean fuel and technology for daily cooking
SDG 13	4674 tCO ₂	3245 tCO ₂

(01/01/2019) to (31/12/2019)

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 1	755 households with access to biogas for cooking	517 households with access to biogas for cooking
SDG 7	755 households with access to clean fuel and technology for daily cooking	517 households with access to clean fuel and technology for daily cooking
SDG 13	4674 tCO ₂	2920 tCO ₂

(01/01/2020) to (31/01/2020)

Item	Values estimated in ex ante calculation of approved PDD	Actual values achieved during this monitoring period
SDG 1	755 households with access to biogas for cooking	465 households with access to biogas for cooking
SDG 7	755 households with access to clean fuel and technology for daily cooking	465 households with access to clean fuel and technology for daily cooking
SDG 13	397 tCO ₂ *	219 tCO ₂

*Calculated for the (01/01/2020) to (31/01/2020) monitoring period

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

>>

SDG 1	In the project activity 755 units were built. However, many beneficiaries have adopted LPG use for cooking and have abandoned the biogas unit. As a result, 574 units were functioning in the year 2018; 517 units functioning in the year 2019 & 465 units functioning in the month of January 2020.
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SDG 7	In the project activity 755 units were built. However, many beneficiaries have adopted LPG use for cooking and have abandoned the biogas unit. As a result, 574 units were functioning in the year 2018; 517 units functioning in the year 2019 & 465 units functioning in the month of January 2020.
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Item	Remarks on difference
SDG 13	The difference in the estimated values are due to the following points :- The baseline estimations were based in the PDD for 790 units, where in the project activity 755 units were built. As per the 2019 monitoring surveys, 574 units were functioning in the year 2018 and 517 units functioning in the year 2019 & 465 units functioning in the month of January 2020.. Therefore, quantity of Emission Reduction is lower than estimated

SECTION F. Stakeholder inputs and legal disputes

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

>> *There were not grievances received from the stakeholder during the monitoring period together with their respective answers/actions.*

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

>> *No inputs/grievances were received in the previous monitoring period.*

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

There were no legal contest or dispute risen with the project activity during the monitoring period.