



**Monitoring report form
(Version 05.1)**

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT

Title of the project activity	Social Education and Development Society (SEDS) Biogas CDM project for the rural poor	
UNFCCC reference number of the project activity	CDM Reference No: 3541	
Version number of the monitoring report	03	
Completion date of the monitoring report	02/05/2016	
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 3 Duration of this monitoring Period: (first and last days included (01/05/2014 to 31/10/2015))	
Project participant(s)	M/s Social Education and Development Society (SEDS) (Host Country) Evangelisches Werk für Diakonie und Entwicklung e.V. (Annex I Country)	
Host Party	India	
Sectoral scope(s)	Sectoral Scope: Type I - Renewable Energy Projects	
Selected methodology(ies)	Applied Methodology: I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User, version 01, EB 37	
Selected standardized baseline(s)	N/A	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	24,463 tCO ₂	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0	17,443 tCO ₂

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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(a) Purpose of the project activity and the measures taken for GHG emission reductions

The purpose of this biogas CDM Project activity is to set up 5,000 biogas plants (digesters) of 2 m³ capacity each for single households in 5 Mandals of Anantapur District. Each household has installed a 2 m³ biogas plant and feed cattle dung into the anaerobic digester for the production of biogas for cooking purpose and heating water. The aim of the project is to replace the commonly used inefficient wood fired mud stoves technology, with clean, sustainable and efficient biogas and in this way replace non-renewable biomass with biogas for cooking and hot water heating.

Anantapur is a drought prone region, with very meagre forest area. Nearly 90% of 3.37 t of biomass used per family per year for cooking and heating water in the District is non-renewable. By burning this firewood, the users were causing emission of greenhouse gases in the baseline.

In the project activity, fuel wood is replaced with the renewable biogas, thus avoiding greenhouse gas emissions of the baseline.

(b) Brief description of the installed technology and equipment

The biogas plant (Deenbandhu Model) consists of a digester with a fixed, non-movable gas space. Families load cattle dung through the inlet chamber into the fixed dome made of bricks and cement, located outside the kitchen. Biogas is produced through anaerobic digestion of the dung and stored in the upper part of the digester before being piped to the biogas stove in the kitchen. Users prepare batches of slurry in the mixing tank, before allowing the final mixture to flow into the digester for methane formation phase. The recovered gas is combusted and used for cooking and water heating. The gas pressure displaces the digested slurry into the compensating tank, ready to be used as manure.

(c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)

This is the third monitoring report for the period 1st May 2014 to 31th October 2015.

The project was registered on 9th Sept 2010 and the start date of crediting period is 1st January 2011. The project was implemented after forward carbon funds were secured. The start date of construction of the first biogas unit was 16th December 2010. The first biogas unit was commissioned and started using it from 3rd March 2011.

The details of the first and second monitoring and verification for the project activity are as follows:

Monitoring Report and Verification	Monitoring Period	Biogas Units for which ERs claimed (Numbers)	Net Emission Reductions (tCO ₂)	Status
I	01 st January 2011 to 31 st December 2012	2,403	6,043	Issued
II	01 st January 2013 to 30 th April 2014	3,014	9,932	Issued

Mandal	Details of Biogas Units Commissioned		Details of Biogas Units under Construction		Total No. of villages**
	No. of Units	No. of Villages	No. of Units	No. of Villages	
Chilamathur	906	69	124	42	70
Gorantla	968	80	95	38	83
Penukonda	393	33	91	19	33
Roddam	1379	57	174	45	57
Somandepalli	829	44	83	23	44
Total	4475	283	567	167	287

**It includes total number of villages in which biogas units are commissioned and under construction

So far, up to 31st October 2015, 4475 units have been commissioned and 567 are under construction. More than 5000 units have been initiated for construction as there will eventually be dropouts during construction or after commissioning. Of the units constructed so far, many of the units have got demolished too, so these constructed units will replace the demolished units eventually. But the total emission reductions will only be claimed for 5000 units after all the units are commissioned. All the remaining units are anticipated to be commissioned by end of June 2016 in phases. All the 4475 units commissioned are monitored for their continuous operation, including units under repair and maintenance for different periods of time. The downtime for each of the unit has been recorded, and emission reductions has been discounted for days not used. Many of the units that are structurally damaged are not repaired so far due to lack of financial resources for repairs.

The domestic biogas units are in continuous operation after installation. The dates of installation for each of the unit is recorded and included in the excel ER calculations sheet (see *CER Calculations.xlsx*). In between, due to repair and maintenance, some of the biogas units may not be in operation. As recorded in the CER calculations excel sheet, due to structural damages, many units have not functioned throughout the monitoring period. The days not operational is recorded for each of the unit. This information is included in the excel ER calculations sheet (see *CER Calculations.xlsx*). The date on which the problem occurred and the problem was fixed is recorded in the village level monitoring sheets and then entered into the monitoring solution, which is the basis for ER calculations excluding non-operational days of the installed units.

(d) Total GHG emission reductions achieved in this monitoring period

The total GHG emission reductions achieved in this monitoring period is as follows:

Summary of the Project Activity and ERs Generated for the Monitoring Period	
Start date of second monitoring period	01-May-2014
Carbon credits claimed up to	31-Oct-2015
Total Biogas Units Commissioned till 31 st October 2015	4,475
Total ERs generated (after subtracting for non-operational days) and accounting for leakage	17,443
ERs generated for the period 1st May 2014 to 31st October 2015	17,443

A.2. Location of project activity

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- (a) Host Parties: India
- (b) Region/State/Province: Andhra Pradesh

- (c) City/Town/Community: Anantapur District, 5 Mandals – Penukonda, Roddam, Somandepalli, Gorantla and Chilamathur.
- (d) Physical/Geographical location:

Anantapur District lies between 13'-40' and 15'-15' Northern Latitude and 76'-50' and 78'-30' Eastern Longitude. It is bound by Bellary, Kurnool District on the North, Cuddapah and Kolar Districts of Karnataka on South East and North respectively. The coordinates of the Mandals are as follows:

Mandals	Co-ordinates
Penukonda	14° 05' 00" North, 77° 35' 00" East
Roddam	14° 06' 00" North, 77° 26' 00" East
Somandepalli	14° 00' 44" North, 77° 36' 30" East
Gorantla	13° 59' 21" North, 77° 46' 13" East
Chillamathur	13° 34' 25" North, 80° 00' 12" East



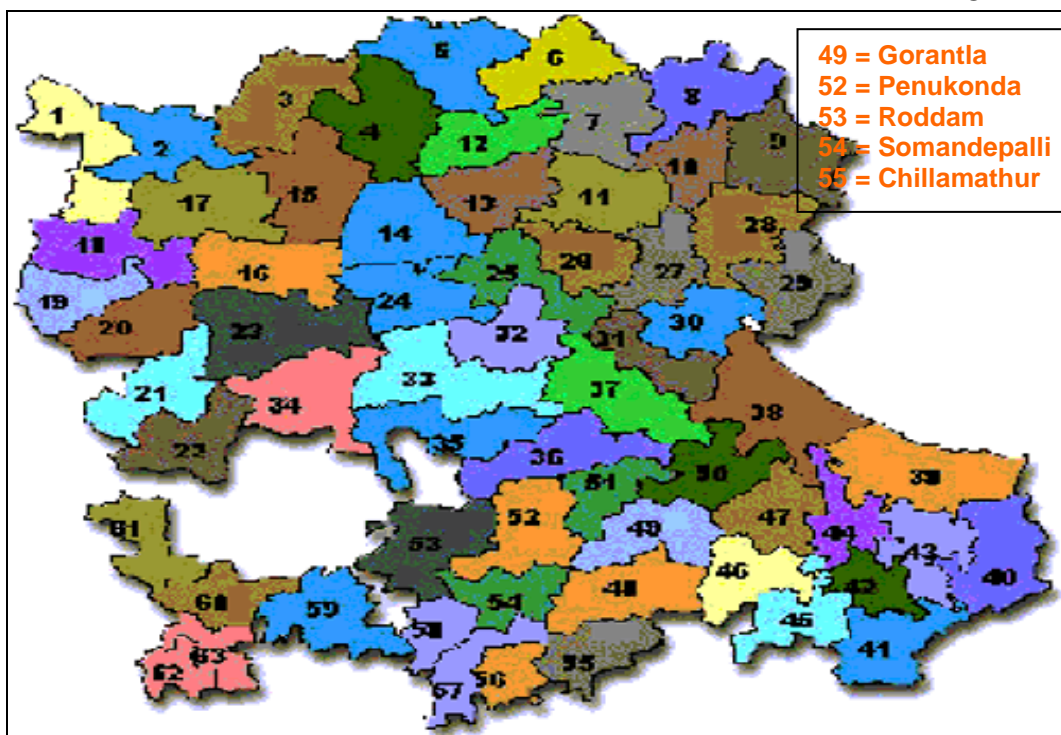


Fig 1: Map of Andhra Pradesh with an arrow indicating the location of Anantapur district and Anantapur district showing the Mandals in which the project will be implemented

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
INDIA (host)	Private entity: M/s Social Education and Development Society (SEDS)	No
Germany (Annex I)	Evangelisches Werk für Diakonie und Entwicklung e.V.	No

A.4. Reference of applied methodology and standardized baseline

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TYPE I - RENEWABLE ENERGY PROJECTS, I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User, Version 01, EB 37.

A.5. Crediting period of project activity

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- (a) Type: Renewable
- (b) Start Date: 01/01/2011
- (c) Length of the crediting period: 7 yrs – 0 months (01 Jan 11 - 31 Dec 17)
- (d) Monitoring Period corresponding to this Verification: 01/05/2014 – 31/10/2015

A.6. Contact information of responsible persons/entities

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Dr. Sudha Padmanabha, Senior CDM Specialist, Fair Climate Network (FCN)
 Mrs. Manil Jyasena Joshua, CEO, Social Education & Development Society.
 Mr. G. Kasi Vishwanatha Rao, System Admin, Social Education & Development Society.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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According to the registered PDD, after registration of the project and securing CER forward finance funding, the project was to be implemented in phases in 2 years. During the first year 2,500 units was to be built followed by another 2,500 in the second year, totaling to 5,000 biogas units. During implementation, the project proponent is facing several issues as detailed below, due to which there is a delay in construction of the units:

- Though the project got registered on 9th September 2010, after signing the ERPA and obtaining forward funding, the actual construction started only by 16/12/2010.
- Though the end users were identified before the implementation of the project activity, biogas could not be built for many end users, the main reason being, (a) migrations of families to neighboring villages, (b) unsuitable site conditions such as rocky or sandy, which prevents excavation of land to construct the biogas dome, etc. For many households, the excavation had to be abandoned mid-way as the site conditions were not conducive. During construction, many units caved in and construction had to be abandoned. End users have to be identified who had cattle, space to build them and the site conditions are suitable for excavation and construction of biogas units. Thus, interested end users within the project boundary of the rural regions in 5 Mandals in Anantapur District are being identified and provided with biogas units.
- Training programs are being conducted for masons, Village Level Volunteers, Biogas Case Workers and the end users about the project activity before implementation in a village. Trained masons to build biogas left in between, thus slowing the progress of construction. New masons had to be trained to replace them.
- There are delays in construction during monsoon season. Also the families take a lot of time for filling in dung into the digester. On an average, the time taken for filling in dung for production of biogas is 122 days. This has also led to delay in commissioning of biogas units.
- As of 31st October 2015, 4,475 biogas units are constructed and 567 are under construction.

Mandal	Details of Biogas Units Commissioned		Details of Biogas Units under Construction		Total No. of villages**
	No. of Units	No. of Villages	No. of Units	No. of Villages	
Chilamathur	906	69	124	42	70
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Total	4475	283	567	167	287

**It includes total number of villages in which biogas units are commissioned and under construction

So far, up to 31st October 2015, 4,475 units have been commissioned and 567 are under construction. All the 4,475 units commissioned are monitored for their continuous operation, including units under repair and maintenance for different periods of time. The downtime for each of the unit has been recorded, and emission reductions has been discounted for days not used. A detailed breakdown time for each of the biogas unit is shown in excel sheet (see *CER Calculations.xlsx*).

Technology/Measure

The biogas plant (Deenabandhu Model Fig: 2) consists of a digester with a fixed, non-movable gas space. Users prepare batches of dung slurry in the mixing tank, before allowing the final mixture to flow into the digester for methane formation phase. By utilizing dung substrate in an anaerobic digestion and combustion system, biogas is made available. Biogas is generated by fermentation of cellulose rich organic matter under anaerobic conditions. In anaerobic conditions, the methane-producing bacteria become more active. The anaerobic digestion consists of three stages: I Hydrolysis; II Acid formation and III Methane fermentation. The processes are carried out by two sets of bacteria namely acid forming bacteria and methane formers. The acidogenic phase I is the combined hydrolysis and acid formation stages in which the organic wastes are converted mainly into acetate, and phase II is the methanogenic phase in which methane and carbon dioxide are formed. The recovered gas is combusted and used for cooking and water heating. The chosen methane recovery and combustion system is the time tested Deenabandhu model biogas technology which is well-known in India.

The individual plant consists of a mixing chamber where waste water and cow dung are mixed, an inlet pipe to feed the slurry into the reactor, the main biogas reactor/digester where methane formation/recovery takes place, a slurry outlet pipe, an outlet chamber, and a slurry platform. The outlet pipe and tank are provided to remove the digested/treated sludge or fermentation residue and the slurry platform is provided to maintain the treated slurry in clean condition. A pipe leading from the top of the dome to the stove will be provided to supply biogas to a 2-ring stove inside the house.

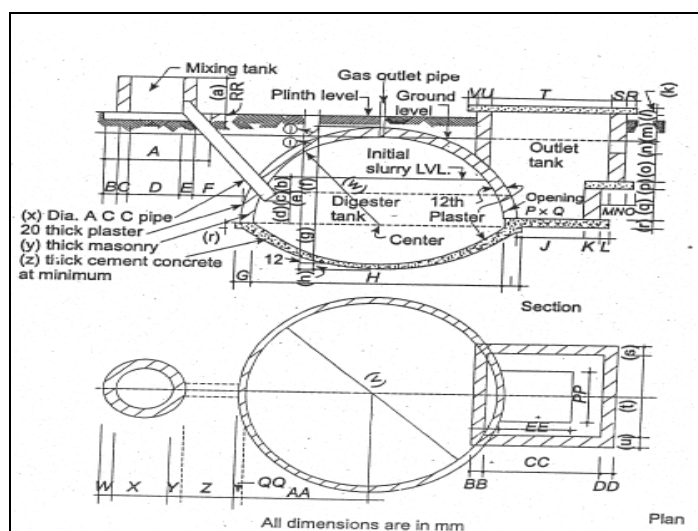


Fig 2: Diagram of a cross-section of the Deenabandhu 2 m³ biogas model

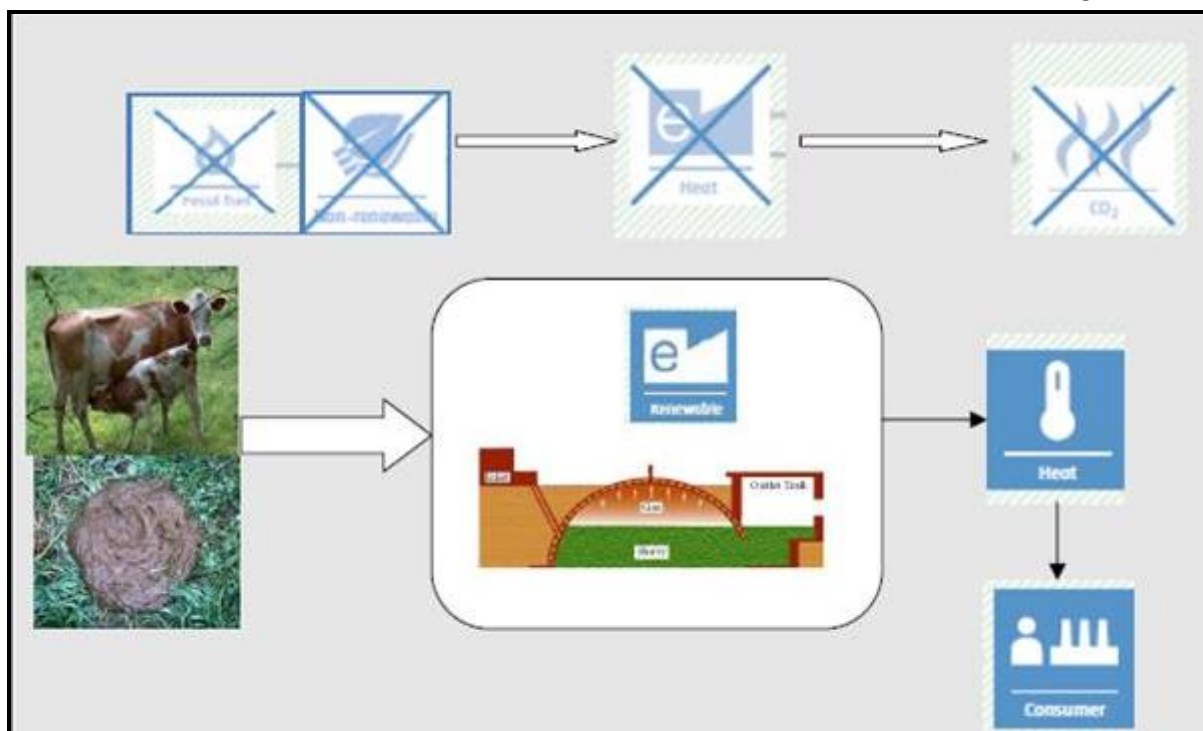


Fig 3: Technical process and equipment of biogas unit



In construction Deenabandhu Biogas Unit in the project area and Biogas Stove in the kitchen

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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There are no temporary deviations from registered monitoring plan or applied methodology.

B.2.2. Corrections

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There are no corrections to project information or parameters fixed at validation.

B.2.3. Changes to start date of crediting period

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There are no changes to start date of crediting period.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

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There is no inclusion of a monitoring plan to the registered PDD that was not included at registration.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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There are no permanent changes from registered monitoring plan and applied methodology.

B.2.6. Changes to project design of registered project activity

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During the first monitoring period, there was a change to the project design of the registered project activity, which was accepted by the CDM EB. The change to the project design of registered project activity is with regard to addition of multiple sites. The beneficiaries that showed interest and were identified upfront for the project activity during the survey in 2008, were in 121 villages in 5 Mandals of Anantapur District. During the course of implementation there were (a) migrations to neighboring villages, (b) unsuitable site conditions such as rocky or sandy nature which prevented excavation of land to construct the dome, etc. Thus, interested end users from within the project boundary of the 5 Mandals in Anantapur District will be identified and provided with biogas unit. The project will still be implemented in the villages of 5 Mandals of Anantapur District, which is in the project boundary, but will be in more than 121 villages as stated in the registered PDD.

This change to the project design of the project activity was approved by CDM EB on 11th July 2013¹.

B.2.7. Types of changes specific to afforestation or reforestation project activity

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This section is not applicable.

SECTION C. Description of monitoring system

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Project Management/Team structure

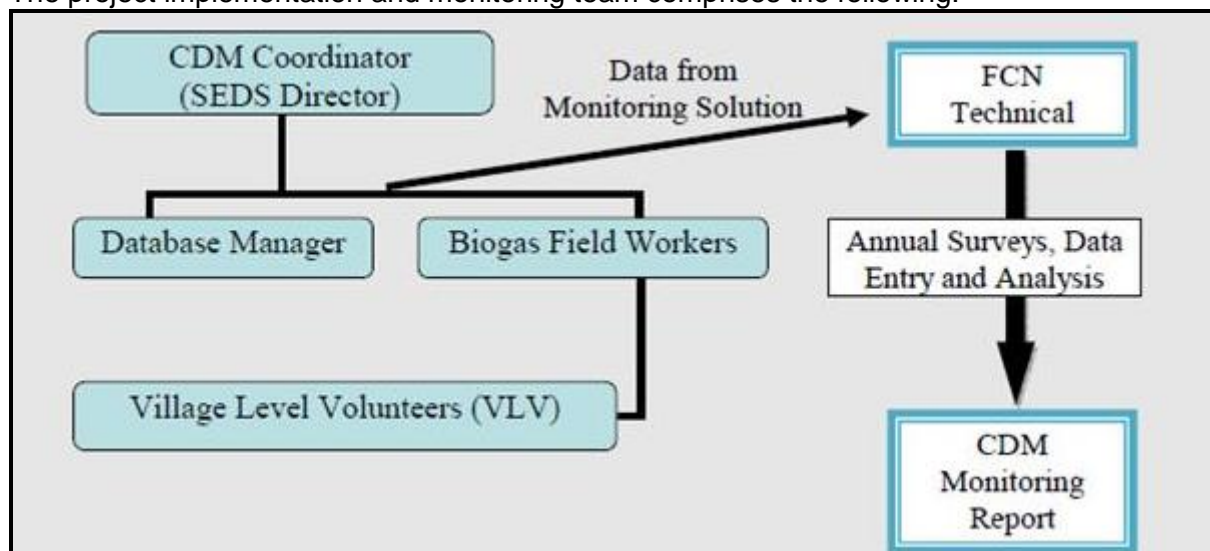
This biogas CDM project is implemented and monitored by the Social Education and Development Society (SEDS). So far, the project is being implemented for 4,475 members of the SEDS village organisational network in 283 villages and 828 are under construction. A Standard Operation Procedure Manual has been prepared for implementation and monitoring of the project activity, which is followed by the CDM Team.

The SEDS CDM Coordinator manages the project on a full time basis. One data manager and 11 biogas field workers are working full time to ensure movement of material and construction of biogas units in the project area. 91 masons have been trained by masons from the neighboring Chickballapur district (with 2 CDM biogas project activities) to construct biogas units. These masons have been contracted on a piece-rate basis for the construction of the biogas units. The village level volunteers (VLV) have been selected at the village level. They maintain a daily usage

¹ <http://cdm.unfccc.int/Projects/DB/RWTUV1269520327.35/view>

register for each of the unit built in their village. This data is collected by the biogas field workers and entered into the digitized monitoring system on a monthly basis.

The project implementation and monitoring team comprises the following:



A digitized monitoring system, custom built for monitoring this Biogas CDM Project, has been provided by Tristle Technologies Pvt. Ltd. This is used to enter data on a regular basis, which generates real-time Progress Reports. Inputting data into this monitoring solution is permission driven – i. e. each Biogas Field Worker can record construction progress of only those villages entrusted to them. Progress and Analytical Reports is totally transparent, open for one and all.

After the construction and satisfactory functioning of each biogas plant for a minimum of 7 days, an end user agreement on legal paper has been signed with the respective beneficiary, and this date has been taken as the day of commissioning of that particular biogas unit. Thus, from day 1 of the commissioning of the biogas plant, full account of emission reduction has been considered.

The village level volunteer through undertaking daily usage monitoring will discover if any unit has become dysfunctional. The beneficiaries have also been provided the phone numbers of the village level volunteers/Biogas Field Workers, so that they can phone and report when the units are dysfunctional. They inform the biogas field worker who will visit the unit and assess requirements. Thus all the constructed biogas units are monitored for their operation.

An annual stratified sample survey of non-biogas users was carried out at household level within the project area. The quantity, source and method of fuel wood collection were assessed to derive at the quantity of non-renewable biomass being used that can be attributable to the project activity. The findings of this survey provided for any deviation in the quantity of non-renewable biomass being used by non-project households/users attributable to the project activity to account and adjust B_y when calculating the overall emission reductions.

The monitoring system and information flow is shown schematically in Fig 4.

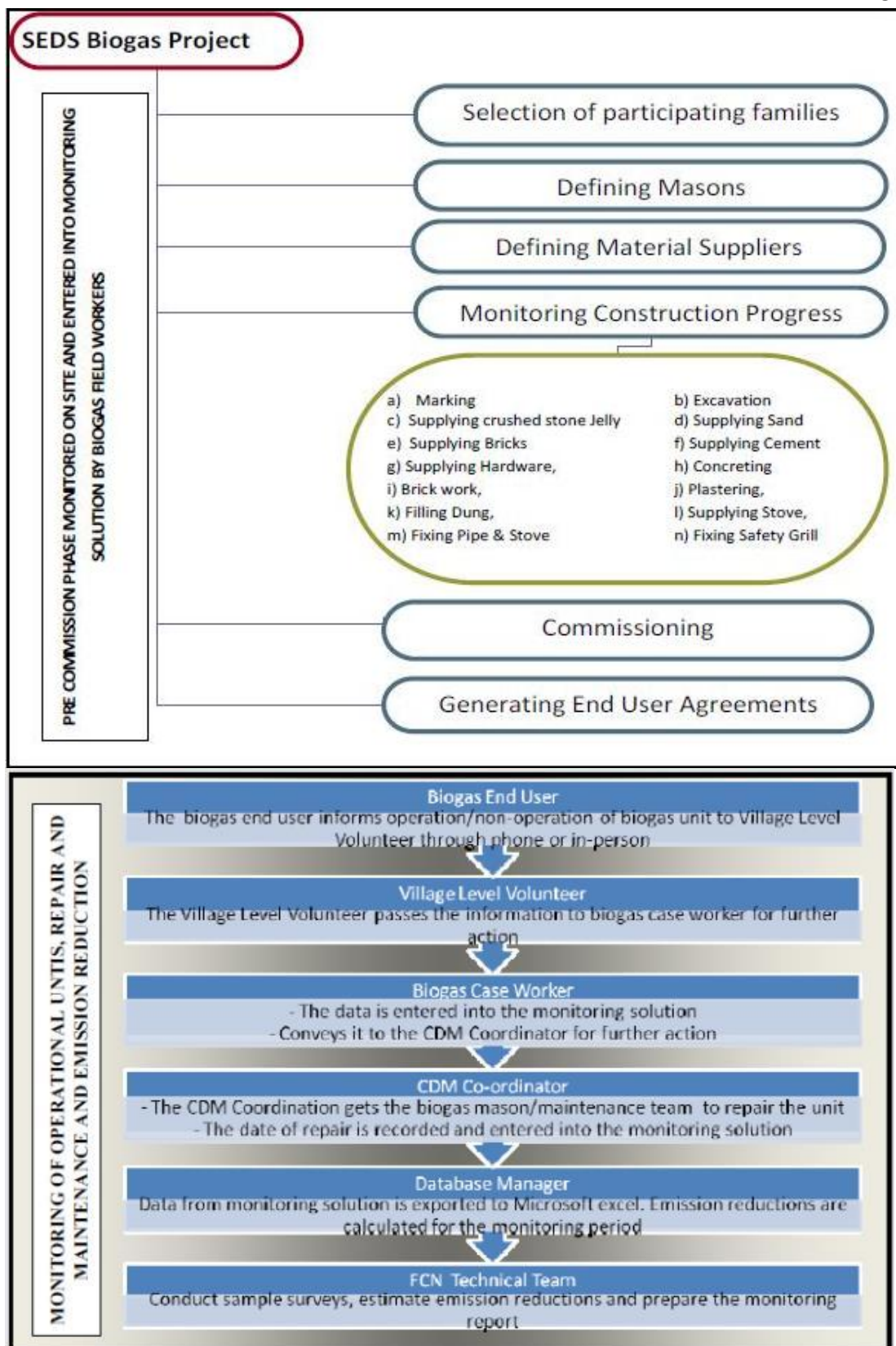


Fig 4: Schematic diagram of monitoring system and information flow in the project activity

Monitoring system

Data collection procedures

Data Generation: The data of construction processes as shown above from marking for the biogas unit to commissioning the biogas unit is recorded on paper and entered into the monitoring

database by the Biogas Field Workers. The end users of biogas units under the CDM project activity sign an end-user agreement, which contains details of the end-user, the Unit ID number, date of commissioning of biogas and other terms and conditions. These agreements are notarized legal agreements countersigned by the End User and SEDS, the NGO.

The non-usage biogas days are also recorded and entered into the monitoring database. The data entered into the monitoring database is exported to excel sheet for analysis. The generated data is used for emission reduction calculations.

Data Aggregation and Recording

Biogas Construction: The biogas construction processes are monitored on a day to day basis and database maintained from its initiation to completion dates for each of the biogas unit. Suppliers and masons are identified with personal data and digital photographs fed into the computerized databank for verification.

A digitized monitoring database system, custom built by Tristle Technologies Pvt. Ltd., is being used to enter data to generate real-time data. Inputting data into this monitoring solution and non-usage days is done on a regular basis.

Each of the biogas unit has been marked with the Unit ID, which makes it distinct. These evidences validate the construction and commission of total 4,475 biogas plants built in the project area.

The list of biogas users are identified by a User ID, the name of the beneficiary, the village and the Mandal (*CER Calculations.xlsx*). The start date of construction, the processes during construction till the date of commissioning are monitored and entered into the database.

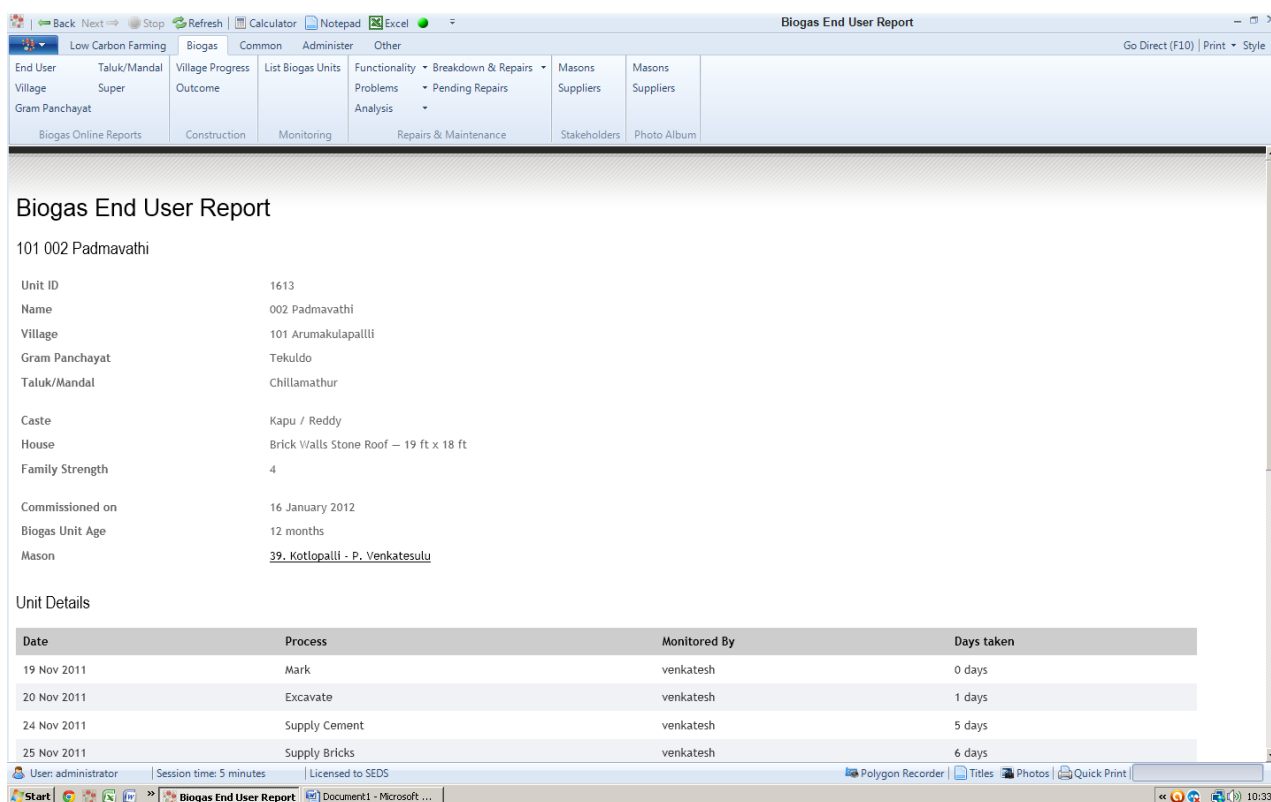


Fig 5: Screen Shot of the Monitoring database solution

The database is updated regularly as and when Biogas Field Workers return from their respective villages.

Non-Usage Days: The information on biogas non-usage days are recorded by the VLV or Biogas Field Workers. The end users also communicate through mobile phones either to VLV or the Biogas Field Workers. The information is updated to the individual biogas user's Monitoring Database on a regular basis.

Data Storage for calculations of emission reductions

The parameters monitored daily during construction of the units are entered on paper which is maintained for each of the unit by the Biogas Field Workers. This is entered into the Monitoring Database for each of the biogas unit.

The non-usage days of biogas units are also recorded on paper and entered into the Monitoring Database on regular basis.

Thus data of all processes of biogas construction and non-usage is stored and maintained at the SEDS head office on the SEDS Monitoring Database.

The data of surveys conducted as described in section D.3 was entered into excel sheets and analysed. This data is stored on paper and electronically.

Calculation and reporting

The data generated through monitoring is stored in the SEDS monitoring database. From this database, data is exported to Microsoft excel sheets, which is used for emission reduction calculations and reporting.

The emission reductions calculations in excel sheet (*CER Calculations.xlsx*) submitted to the DOE is thus transparent and verifiable with the SEDS Monitoring Solution.

QA & QC procedures and emergency procedures for the monitoring system

After selection of the beneficiary, an agreement between SEDS and the Beneficiary of SEDS Biogas Project is signed, wherein SEDS have briefed of the material that will be supplied to the beneficiary for construction of the unit and the beneficiary is made aware of their contribution through kind towards the project activity. For each of the unit, the dates of material supply and the processes are maintained on paper, which is entered into the monitoring database. All the monitoring books are maintained at the SEDS head office. The statutory reports, receipts and payments made for the construction are maintained for verification.

Each unit has the unit ID number and date of construction etched on it for field identification and cross check.

Tristle Monitoring Solution has its own software for data backup and restore. The Data Manager has to just select the path and save the backup. This software will back up the entire Database along with photographs. Data backup is taken once every 15 days as emergency procedure. These backups are stored in a separate external HDD meant only for backups.

Quality Control is ensured, wherein the end-user supervises the construction, checks the quality of installed biogas plants to ensure that the required materials were used for the construction of biogas units. They endorse the installation through a signed beneficiary acknowledgement, after which the end user agreement is signed.

Suppliers and masons are identified with personal data and digital photographs fed into the computerized databank for verification.

The data from the monitoring solution is analysed and emission reduction calculated independently by FCN Technical Team. Annual surveys are also conducted by the FCN Tech team for inclusion in the Monitoring Report. Thus a third party is involved in preparation of CDM Monitoring Report.

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

Data/parameter:	Rating of Biogas
Unit	kW/digester
Description	Capacity of a digester
Source of data	Calculated as shown in Section B.2 of PDD
Value(s) applied)	1.78
Choice of data or measurement methods and procedures	As calculated in the registered PDD
Purpose of data	According to the "Instructions for filling out the monitoring report form" the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. The data is not used for estimation of emission reductions.
Additional comments	Qualifies as a small-scale project

Data/parameter:	B_y
Unit	tonnes/family/year
Description	Quantity of biomass that is substituted or displaced in tonnes.
Source of data	Registered PDD
Value(s) applied)	3.37 tonnes/year/family
Choice of data or measurement methods and procedures	As calculated in the registered PDD
Purpose of data	According to the "Instructions for filling out the monitoring report form" the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity.
Additional comments	Based on surveys conducted in the project area and detailed in the registered PDD.

Data/parameter:	f_{NRB, y}
Unit	-
Description	Fraction of Non-Renewable Biomass
Source of data	Registered PDD
Value(s) applied)	90% or 0.90
Choice of data or measurement methods and procedures	As demonstrated in the registered PDD
Purpose of data	According to the "Instructions for filling out the monitoring report form" the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity.
Additional comments	Calculated as per AMS I.E., Version 1 methodology and described in the registered PDD.

Data/parameter:	NCV_{biomass}
Unit	TJ/tonne
Description	Net Calorific Value of Biomass
Source of data	IPCC
Value(s) applied)	0.015
Choice of data or measurement methods and procedures	Default value as given by the methodology
Purpose of data	According to the "Instructions for filling out the monitoring report form" the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity.
Additional comments	As given in AMS I.E., Version 1 methodology

Data/parameter:	EF_{projected_fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission Factor of Kerosene
Source of data	Methodology I.E. Version 1
Value(s) applied)	71.5
Choice of data or measurement methods and procedures	Default value as given by the methodology
Purpose of data	According to the "Instructions for filling out the monitoring report form" the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity.
Additional comments	As given in AMS I.E., Version 1 methodology

D.2. Data and parameters monitored

Data/parameter:	Biogas Units constructed
Unit	Number
Description	Number of biogas units constructed
Measured/calculated/default	Measured
Source of data	The biogas construction is monitored from the start till completion for all the processes as shown in Fig 4 from marking to fixing safety grill and commissioning of the unit. This is entered into the monitoring database for each of the unit. Thus the timeline of construction of the units is monitored and database maintained.
Value(s) of monitored parameter	4,475 biogas units have been constructed and operational by 31 st October 2015.
Monitoring equipment	There are no monitoring equipment's. The construction of biogas units are monitored at the field and record maintained. The data for each unit is transferred to the monitoring database.
Measuring/reading/recording frequency:	The construction processes is monitored on a day to day basis from pre-commission till commissioning for all the biogas units.
Calculation method (if applicable):	There are no calculations involved.
QA/QC procedures:	100% of the units are monitored from the procurement of material till construction and commissioning of the biogas units.

Purpose of data:	-According to the “Instructions for filling out the monitoring report form” the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity. -The data is used to estimate the emission reduction for the number of biogas units constructed and commissioned.
Additional comments:	The emission reductions are calculated after the unit is commissioned and the end users are happy with the usage for at least 7 days. The emission reduction is calculated from the date of commission. This can be triangulated with the end user agreement signed between the end user and SEDS.

Data / Parameter:	Number of biogas plants operating
Unit:	Number
Description:	Number of plants operating in year
Measured/ Calculated / Default:	Measured
Source of data:	Field data monitored on a day to day basis is entered into the monitoring solution. Log books are maintained and entered in the digitized monitoring database. Biogas units non-operating are monitored and recorded. This inversely gives the data of operational units on a day to day basis for each of the unit.
Value(s) of monitored parameter:	4,475 biogas units have been constructed and operating by 31 st October 2015. The duration of non-usage and the reason is monitored. The data of operating days for each and every biogas unit is given in the excel sheet CER Calculations.xlsx.
Monitoring equipment:	There is no monitoring equipment. The biogas units are monitored for non-usage by the Village level volunteers/Biogas Field Workers. All the units are being recorded and entered into the monitoring solution.
Measuring/ Reading/ Recording frequency:	The units are monitored for its usage on a day to day basis for all the units constructed and commissioned.
Calculation method (if applicable):	For a particular day, the number of operating systems is all the units which were functional. The number of operational days during the monitoring period for each of the system was determined to estimate the emission reductions.
QA/QC procedures:	For efficient monitoring, continuous day to day monitoring was done. A user friendly survey sheet for each of the biogas user was maintained at the village level. Hence continuous monitoring of the operational units is being done.
Purpose of data:	According to the “Instructions for filling out the monitoring report form”, the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	Emission Reductions were deducted or not calculated for non-functional days of the units.

Data / Parameter:	Confirmation that non-renewable biomass of B_y has been substituted
Unit:	tonnes / yr
Description:	Confirmation that non-renewable biomass has been substituted

Measured/ Calculated / Default:	Measured.
Source of data:	Sample survey. Annual stratified sampling was conducted for the period 2014 and 2015.
Value(s) of monitored parameter:	<p>Based on the stratified sample survey, the extent of replacement of non-renewable fuelwood is complete. Few households use renewable biomass of which the predominant species is <i>Prosopis juliflora</i> and crop residue of Red gram and Mulberry stalks. As per Annex 18 of the EB 23, this is considered renewable.</p> <p>The non-renewable wood previously used by the beneficiaries is the costliest in terms of time spent to collect or purchase and preparation of the fuel for usage and storage. Thus, by providing a new energy facility to the user which decreases the need for additional fuel usage, the first wood to be replaced is the non-renewable one. Also, renewable wood is available nearer to their homes and fields with less effort and is the first alternative by the user. Thus there is replacement of non-renewable biomass by the project activity.</p>
Monitoring equipment:	There is no monitoring equipment. It is based on sample surveys conducted annually.
Measuring/ Reading/ Recording frequency:	Annually conducted sample surveys.
Calculation method (if applicable):	There are no calculations methods. The sample survey is conducted to confirm that non-renewable biomass has been substituted.
QA/QC procedures:	Stratified random sample survey was conducted.
Purpose of data:	The data is not used for estimation of emission reductions.
Additional comment:	In addition, for non-usage biogas days, it is assumed that biomass has been used and emission reductions are not accounted for those days of non-usage.

Data / Parameter:	Non-usage of biogas plants
Unit:	Days
Description:	Usage of non-renewable biomass in case of non-performance of biogas units
Measured/ Calculated / Default:	Measured
Source of data:	The days not used from the daily monitoring report for each of the unit done at the village level and data maintained on the digitized monitoring database.

Value(s) of monitored parameter:	<p>The domestic biogas units are in continuous operation after installation. In between, due to repair and maintenance, some of the biogas units were not be in operation. The days not operational is recorded for each of the unit. This information is included in the excel ER calculations sheet (see CER Calculations.xlsx). The data was entered into the monitoring solution, which is the basis for emission reduction calculations of operational days of the installed units. The biogas days lost due to repairs and maintenance are as follows:</p> <table border="1" data-bbox="528 409 1417 1137"> <thead> <tr> <th>Problems</th> <th>Number of total biogas days not functional</th> <th>Number of Biogas Units repaired/under repair</th> </tr> </thead> <tbody> <tr> <td>Dome crack</td> <td>52801</td> <td>101</td> </tr> <tr> <td>Unit Demolished</td> <td>15886</td> <td>32</td> </tr> <tr> <td>Empty and Replaster Dome</td> <td>6438</td> <td>29</td> </tr> <tr> <td>Repair Outlet Tank</td> <td>4151</td> <td>8</td> </tr> <tr> <td>Animals Sold (Kitchen Not Used)</td> <td>1558</td> <td>22</td> </tr> <tr> <td>Gobar Stop - Animals Sold</td> <td>1244</td> <td>18</td> </tr> <tr> <td>Repair Inlet Tank</td> <td>1098</td> <td>2</td> </tr> <tr> <td>Gobar Stop (Migrated)</td> <td>882</td> <td>6</td> </tr> <tr> <td>Gobar Stop (Beneficiary Not Interested)</td> <td>559</td> <td>10</td> </tr> <tr> <td>Gobar Mixing dry (Less Gas)</td> <td>40</td> <td>4</td> </tr> <tr> <td>Replace Gas Pipe</td> <td>23</td> <td>6</td> </tr> <tr> <td>Repair Gas Pipe</td> <td>12</td> <td>3</td> </tr> <tr> <td>Replace Gate Valve</td> <td>8</td> <td>1</td> </tr> <tr> <td>Grand Total</td> <td>84700</td> <td>242</td> </tr> </tbody> </table> <p>The various reasons for non-usage of biogas units are as mentioned above. Maximum loss is due to cracking of the biogas doom, which needs to be repaired by emptying and re-plastering the inside of the biogas dome, which accounts for 63% of total downtime. It also accounts for 42% of the problems that leads to downtime of biogas units.</p>	Problems	Number of total biogas days not functional	Number of Biogas Units repaired/under repair	Dome crack	52801	101	Unit Demolished	15886	32	Empty and Replaster Dome	6438	29	Repair Outlet Tank	4151	8	Animals Sold (Kitchen Not Used)	1558	22	Gobar Stop - Animals Sold	1244	18	Repair Inlet Tank	1098	2	Gobar Stop (Migrated)	882	6	Gobar Stop (Beneficiary Not Interested)	559	10	Gobar Mixing dry (Less Gas)	40	4	Replace Gas Pipe	23	6	Repair Gas Pipe	12	3	Replace Gate Valve	8	1	Grand Total	84700	242
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Monitoring equipment:	There is no monitoring equipment to measure this parameter. This is based on data recorded by the Village level volunteers/Biogas field workers and entered into the monitoring database.																																													
Measuring/ Reading/ Recording frequency:	It is monitored on a day to day basis by the Village Level Volunteers at village level/Biogas field workers, which is entered into the monitoring solution for all the biogas units.																																													
Calculation method (if applicable):	The operational days in a year for a biogas unit are 365 days minus non-operational days.																																													
QA/QC procedures:	<p>-As per the methodology, the number of non-operational days of biogas units need not be measured. To be conservative and reduce uncertainty, the ERs are deducted for the days each of the commissioned biogas unit is not functional.</p> <p>-Also the main objective of the project activity is to provide thermal energy to the rural households thereby reducing drudgery to women in the region. Thus continuous monitoring and repairs are taken up by SEDS, the NGO (PP). This helps to also provide quality data to estimate emission reductions with certainty.</p>																																													

Purpose of data:	To calculate emission reductions for only the operational days for each biogas unit. According to the “Instructions for filling out the monitoring report form”, the purpose of data needs to be in terms of calculation of baseline emissions, project emissions or leakage. But according to the methodology, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	This information is included in the excel ER calculations sheet (see CER Calculations.xlsx) for each of the unit.

Data / Parameter:	Diversion of non-renewable biomass saved under the project activity by non-project households
Unit:	tonnes/year
Description:	Diversion of non-renewable biomass saved under the project activity by non-project households
Measured/ Calculated / Default:	Stratified annual sample survey
Source of data:	Leakage data is based on sample survey of non-biogas users. To be conservative, it is based on latest version of the methodology, I.E, Version 5.
Value(s) of monitored parameter:	-According to the survey conducted during the year 2014 and 2015, there is no diversion of non-renewable biomass saved under the project activity by non-project households. -But to be conservative, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages.
Monitoring equipment:	-There is no monitoring equipment for this monitoring parameter. It is based on sample survey of non-biogas users. -But to be conservative in calculations, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages (based on the latest version of I.E methodology, Version 5)
Measuring/ Reading/ Recording frequency:	Annual stratified sample survey
Calculation method (if applicable):	-Based on the sample survey, there is no discounting factor to be applied. -But based on the latest methodology version, leakage is accounted after multiplying B_y with 0.95 and estimating the emission reduction. B_y for the monitoring period is 19,068. Considering leakage $B_y * 0.95 = 19,068 \text{ t} \times 0.95 = 18,115 \text{ t}$ for the monitoring period. Hence the diversion of non-renewable biomass considered for the monitoring period is $19,068 - 18,115 = 953 \text{ t}$. The emission reduction before considering leakage is 18,361 and after considering leakage is 17443. Hence the estimated leakage is 918 tCO ₂ .
QA/QC procedures:	Though the survey does not imply diversion of non-renewable biomass saved under the project activity by non-project households, to be conservative, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages.
Purpose of data:	To calculate leakage from the project activity.
Additional comment:	Though Version 1 of I.E. methodology does not discount for leakage, to be conservative and decrease uncertainty, B_y has been multiplied by 0.95.

D.3. Implementation of sampling plan

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The data monitored for the project activity is as follows:

- (i) Biogas units constructed

- (ii) Number of biogas plants operating
- (iii) Non-usage of biogas units
- (iv) Confirmation that non-renewable biomass of B_y has been substituted
- (v) Diversion of non-renewable biomass saved under the project activity by non-project households

The parameters (i) to (iii) have been collected for all the biogas units constructed and operating. For the parameters (iv), an annual stratified sample survey of biogas users was conducted, while for parameter (v), a sample survey of non-biogas users or households using traditional cook stoves was conducted.

- (i) Objectives and Reliability Requirements:** The objective of the sampling effort is to;
- a) Assess or confirm that non-renewable biomass has been substituted by biogas users and
 - b) To assess if there is diversion of non-renewable biomass saved under the project activity by non-project households. The sample size was determined to obtain 90/10 confidence/precision levels.

(ii) Target Population: The target population is 4,475 rural households for which biogas were constructed in 5 Mandals of Anantapur district for parameter (a) above. The target population for parameter (b) above are the non-biogas users within the project boundary.

(iii) Sampling Method: The sampling method chosen for the project area is stratified random sampling, wherein each Mandal is a stratum. It is easy to implement as the sampling frame (household details for which biogas were implemented) was collected and stored in the monitoring database. Each of the five Mandals – Penukonda, Roddam, Somandepalli, Gorantla and Chilamathur was treated as a stratum. Thus sampling was done for each of the Mandal to ensure that all the areas were well represented.

v) Sampling Frame: For (a), sampling frame that was used is the complete listing of all the rural households for which biogas was built under the project activity in Penukonda, Roddam, Somandepalli, Gorantla and Chilamathur Mandals, Anantapur District, Andhra Pradesh. Each of the household has a unique identification number with all the required details of the family.

vi) Determination of sample size: Determination of sample size is in accordance with Annex 06, EB 67, “Guidelines for sampling and surveys for CDM project activities and programme of activities, Version 4²”, which specifies the reliability requirements and describes appropriate sampling methods applicable to small-scale projects.

The sample frame is homogeneous, wherein the families are from rural region from similar socio-economic strata and similar cooking habits. Thus, the sample size required to achieve a required level of reliability was calculated based on the following formula:

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

Where:

- n Sample size
- N Total number of households (3579 for 2014 and 4475 for 2015)
- p Our expected proportion (0.68) (Based on the status of biogas units not operational from online monitoring solution).
- 1.645 Represents the 90% confidence required
- 0.1 Represents the 10% relative precision p

2014	2015
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² https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

$n \geq \frac{1.645^2 \times 3579 \times 0.68 \times (1 - 0.68)}{(3579 - 1) \times 0.1^2 + 1.645^2 \times 0.68 \times (1 - 0.68)} = 58$	$n \geq \frac{1.645^2 \times 4475 \times 0.68 \times (1 - 0.68)}{(4475 - 1) \times 0.1^2 + 1.645^2 \times 0.68 \times (1 - 0.68)} = 59$
If we expect the response rate from the sampled households to be only 80%, then the scale up for the survey would be 58/0.8 = 73 households.	If we expect the response rate from the sampled households to be only 80%, then the scale up for the survey would be 59/0.8 = 74 households.

Apportioning to all the Mandals, the number of households to be sampled is as follows:

Mandals	Total Number of Households (2014)	Total Number of Households (2015)
Chilamathur	$\frac{578}{3579} \times 73 = 12$	$\frac{906}{4475} \times 74 = 15$
Gorantla	$\frac{646}{3579} \times 73 = 14$	$\frac{968}{4475} \times 74 = 17$
Penukonda	$\frac{322}{3579} \times 73 = 7$	$\frac{393}{4475} \times 74 = 7$
Roddam	$\frac{1235}{3579} \times 73 = 26$	$\frac{1379}{4475} \times 74 = 23$
Somandepalli	$\frac{798}{3579} \times 73 = 17$	$\frac{829}{4475} \times 74 = 14$
Total	76	76

The villages were selected using random sample selection in Microsoft excel and again random selection of households in each village. The details of the survey and the field studies conducted for the study is as follows:

Mandal-wise details of villages and end-user households sampled

Mandal	2014		2015	
	Number of Villages	No of Families	Number of Villages	No of Families
Chilamathur	6	12	7	22
Gorantla	7	21	7	21
Penukonda	3	9	3	9
Roddam	6	24	6	18
Somandepalli	4	12	4	12
Total	26	78	26	82

Details of the villages and number of households visited for the survey is as follows:

Mandal	2014		2015	
	Village	HHs	Village	HHs
Chilamathur	Bhumaiahgaripalli	2	K. Chennampalli	3
	Kammaiahgaripalli Thanda	2	Kambalpalli	4
	Korlakunta	2	Kanisettipalli	3
	Madirepalli	2	Lalepalli	3

	Nesevanlapalli	2	Marsalavanlapalli	3
	Somagatta	2	Nesevanlapalli	3
			Tekulodu	3
Gorantla	Budilivandalapalli	3	Bachannapalli	3
	Gaddam Thanda	3	Gaddam Thanda	3
	Gangadevipalli	3	Guntapalli	3
	Kalekuntlapalli	3	Kaligera Thanda	3
	Kamgareddipalli	3	Kamgareddipalli	3
	Samulapalli	3	Palasamudram	3
	V. Gollapalli	3	Singareddiapalli	3
Penukonda	Bandapalli	3	Chinnappareddipalli	3
	Kondapuram	3	Duddebanda	3
	Penukonda	3	Parameshwarapuram	3
Roddam	Bommireddipalli	4	Bucherla	3
	Bucherla	4	Cholemari	3
	Kalipi	4	Kanumara	3
	Nalluru	4	Peddakodipalli	3
	P. Kothapalli	4	R. Maravapalli	3
	Seshapuram	4	Thurkalapatnam	3
Somadepalli	Julakunta	3	Challapalli	3
	Kolimipalli (S)	3	Kollakunta	3
	Nallagondarayanapalli	3	Somandepalli	3
	Rangepalli	3	Velagamekalapalli	3
Total		78	Total	82

For parameter (b), i.e. to assess if there is diversion of non-renewable biomass saved under the project activity by non-project households, the sample size was determined to obtain 90/10 confidence/precision levels. The sample size was determined as follows (Bill Godden, 2004)³:

Sample size of infinite population (where the population is greater than 50,000)

$$SS = \frac{z^2 \times (p) \times (1-p)}{C^2}$$

Where

- SS = Sample size
 Z = Z value (e.g. 1.645 for 90% confidence level)
 P = 0.5 Percentage of population picking a choice (renewable or non-renewable biomass), expressed as decimal
 C = Confidence interval, expressed as decimal (0.1 - 10% confidence interval)

$$SS = \frac{1.645^2 \times (0.5) \times (1-0.5)}{0.1^2} = 67.65 \approx 68$$

The sample survey conducted to study the diversion of non-renewable biomass saved under the project activity by non-project households was stratified as follows:

Mandal	2014	2015
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³ <http://williamgodden.com>

	Number of Villages	No of Families	Number of Villages	No of Families
Chilamathur	6	13	7	21
Gorantla	7	20	7	22
Penukonda	3	9	3	9
Roddam	6	24	6	18
Somandepalli	4	13	4	13
Total	26	79	26	83

Thus it can be seen that the number of households covered for the sample surveys is more than adequate to represent the parameters in the project area. Oversampling was done as a good practice to compensate for any attrition, outliers or non-response associated with the sample.

The data collected was entered into excel sheet for data storage and analysis.

(b) Data

(i) Field Measurements: A household level questionnaire was designed to collect information for the parameters of interest. The frequency of measurement was once a year during the monitoring period. Data was collected for the monitoring year 2014 and 2015.

(ii) Quality Assurance/Quality Control: The QA/QC procedure was to achieve good quality data through field measurements. The household level questionnaire was designed and field tested before administering the actual questionnaire survey. The survey was done by the FCN Technical Team. Oversampling was done to replace non-respondents, if any. The data collected was entered by and further cross-checked by the FCN Team.

(iii) Analysis: The data entry was done in Microsoft excel sheet. The data was cross checked with the filled in questionnaire by FCN as QA/QC procedure. The data was analysed for responses to the parameters.

(c) Implementation

(i) Implementation Plan: The implementation of sampling effort was done the FCN Technical Team. The FCN has the skill and resources to implement the sampling procedure. The team is experienced with rural energy CDM projects implemented for the rural poor. The collected data was analysed by the FCN for inclusion in the monitoring report.

Description of implemented sampling design

All the monitoring parameters i.e. (i) Number of installed 2 m³ systems (ii) Number of operating 2 m³ systems and (iii) Non-usage days of installed and operational biogas plants were monitored on a day to day basis for all the installed units for the monitoring period. These parameters which are required for calculations of emission reduction has no sampling plan as 100% units were monitored for all the parameters. Thus, the data used to calculate emission reduction has high precision and less uncertainty.

Collected data

All the monitoring parameters i.e. (i) Number of installed 2 m³ systems (ii) Number of operating 2 m³ systems and (iii) Non-usage days of installed and operational biogas plants were monitored on a day to day basis and data collected for all the installed units. The data collected was entered into the monitoring solution. For the parameters (iv) and (v), the collected data was analysed.

Analysis of the collected data

The data collected and entered into monitoring solution was exported to excel sheet for data analysis and to calculate the emission reductions of the project activity (*CER Calculation.xlsx*).

(i) Number of installed 2 m³ systems: Of the 5,000 units that were to be constructed under the project, 4,475 units were constructed till 31st October 2015.

(ii) Number of operating 2 m³ systems: The analysis of all the operating systems for each day consolidated for each month is shown in the Microsoft Excel sheet *CER Calculation.xlsx*. The emission reductions are calculated only of units for operational days.

(iii) Non-usage days of installed and operational biogas plants: The non-usage days or non-operating units were monitored on a day to day basis for all the constructed units. Based on the data, which is collected and entered into the monitoring solution, there were repairs, overhaul and maintenance of constructed biogas units. The reasons for the breakdown and total non-operational biogas days for the monitoring period (1st May 2014- 31st October 2015) are as follows:

Problems	Number of total biogas days not functional	Number of Biogas Units repaired/under repair
Dome crack	52801	101
Unit Demolished	15886	32
Empty and Replaster Dome	6438	29
Repair Outlet Tank	4151	8
Animals Sold (Kitchen Not Used)	1558	22
Gobar Stop - Animals Sold	1244	18
Repair Inlet Tank	1098	2
Gobar Stop (Migrated)	882	6
Gobar Stop (Beneficiary Not Interested)	559	10
Gobar Mixing dry (Less Gas)	40	4
Replace Gas Pipe	23	6
Repair Gas Pipe	12	3
Replace Gate Valve	8	1
Grand Total	84700	242

A detailed breakdown time for each of the biogas unit is shown in excel sheet (*ER Calculation.xlsx*).

(iv) Confirmation that non-renewable biomass of B_y has been substituted

Confirmation that non-renewable biomass has been substituted was through annual sample surveys conducted as described in section above. Based on the survey, there has been complete replacement of non-renewable biomass in the project area. Based on the stratified sample survey, the extent of replacement of non-renewable fuelwood is complete. Few households use renewable biomass of which the predominant species is *Prosopis juliflora* and crop residue of Red gram and Mulberry stalks. As per Annex 18 of the EB 23, this is considered renewable.

The non-renewable wood previously used by the beneficiaries is the costliest in terms of time spent to collect or purchase and preparation of the fuel for usage and storage. Thus, by providing a new energy facility to the user which decreases the need for additional fuel usage, the first wood to be replaced is the non-renewable one. Also renewable wood is available nearer to their homes and fields with less effort and is the first alternative by the user.

(v) Diversion of non-renewable biomass saved under the project activity by non-project households
The survey of non-biogas users show that 100% of families respond to no increase in fuelwood use after the project implementation, no increase in cut and carry of fuelwood and no replacement of crop residues (renewable biomass) by fuelwood. In the project area, renewable biomass energy

sources such as crop residue, fallen twigs and branches though low are still the easiest to collect. Comparatively, collection of fuel wood from forests involves time and effort as they are beyond the village and agricultural lands. Thus the quantity of non-renewable wood used by the families has remained the same and not increased due to the project activity. Thus the nearest and easily available source of biomass is collected first, which are the renewable sources of energy. Thus all the 100% respondents of the survey continue to use the same quantity of crop residue and fallen twigs and branches even after the project activity and is not getting replaced by non-renewable wood. Thus, the survey of non-biogas users shows that there is no diversion of non-renewable biomass saved under the project activity by non-project households.

There have been no events or situations that occurred during this monitoring period which has impacted the applicability of the methodology.

Demonstration on whether the required confidence/precision has been met

All the parameters which is required for calculations of emission reductions were monitored for all the installed units. Thus there results of the data has very high confidence and precision level, with very low uncertainly levels.

The surveys conducted were for quantitative data for which confidence/precision is not required and is not included into emission reduction calculations. But, even for this parameter, a discount factor for B_y has been applied based on latest version of the methodology, which is conservative.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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Emission reductions were calculated as:

$$ER_y = B_y * f_{NRB,y} * NCV_{Biomass} * EF_{projected_fossilfuel}$$

Where:

- ER_y = Emission reductions during the year y in tCO₂e
- B_y = Quantity of biomass that is substituted or displaced in tonnes
- f_{NRB,y} = Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods
- NCV_{Biomass} = Net calorific value of the non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
- EF_{projected_fossilfuel} = Emission factor for the projected fossil fuel consumption in the baseline.

The fossil fuel likely to be used by similar consumers is taken: 71.5 tCO₂/TJ for Kerosene.

Emissions from the use of fossil fuels for meeting similar thermal energy needs		
Activity Data	Value	ID Ref
Quantity of Biomass that is substituted (t/family/yr)	3.37	B _y
Quantity of biomass that is substituted (t/yr) for the monitoring period after considering non-operational days (see CER Calculations.xlsx for details).	19,023	B _y
Fraction of NRB	90%	f _{NRB, y}
NCV Biomass (TJ/t)	0.015	NCV _{biomass}
Emission factor Kerosene (tCO ₂ /TJ)	71.5	EF _{projected_fossilfuel}
Emission Reductions after discounting for non-operational days	18,361	ER_y

(tCO ₂ /yr)		
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The total emission reductions for the period 1st May 2014 to 31st October 2015 for the installed and operational 4,475 biogas units are 18,361 tCO₂. The unit-wise calculations of emission reduction are as enclosed in the excel sheet – *CER Calculations.xlsx*.

E.2. Calculation of project emissions or actual net GHG removals by sinks

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There are no project emissions in the project activity.

E.3. Calculation of leakage

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According to the methodology AMS I.E. Version 1:

If the project activity includes substitution of non-renewable biomass by renewable biomass, leakage in the production of renewable biomass must be considered using the general guidance on leakage in biomass project activities.

And

If the equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.

The project does not involve the substitution of non-renewable biomass with renewable biomass, nor will any equipment be transferred from another activity as all units are to be built new specifically for the project. The project will also not result in the displacement of people or activities. Therefore leakage will not take place.

According to the methodology leakage relating to the non-renewable biomass is due to following potential sources:

- a. *Use/diversion of non-renewable biomass saved under the project activity by non-project households/users who previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable biomass used by the non-project households/users attributable to the project activity then By is adjusted to account for the quantified leakage.*

Data on the amount of biomass saved under the project activity that is used by non-project households or users was collected through a stratified sample survey conducted in the project area as detailed in section D. In the project area, renewable biomass energy sources such as crop residue, fallen twigs and branches though low are still the easiest to collect. Comparatively, collection of fuel wood from forests involves time and effort as they are beyond the village and agricultural lands. Thus the quantity of non-renewable wood used by the families has remained the same and not increased due to the project activity. Thus the nearest and easily available source of biomass is collected first, which are the renewable sources of energy. Thus all the 100% respondents of the survey continue to use the same quantity of crop residue and fallen twigs and branches even after the project activity and is not getting replaced by non-renewable wood. In fact, many of the families opined that renewable biomass has increased in the village due to replacement of these sources by biogas due to the project activity.

- b. *Use of non-renewable biomass saved under the project activity to justify the baseline of other CDM project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable biomass saved under the project activity that is used as the baseline of other CDM project activity then By is adjusted to account for the quantified leakage.*

Based on web check of UNFCCC and national DNA website, there were no CDM project activities in the region implemented after the registration of SEDS Biogas Project. Thus there are no project activities to justify the baseline of other CDM project activities to be a potential source of leakage. Thus there is no portion of non-renewable biomass saved under the project activity that is being used as a baseline of other CDM project activity to adjust B_y to account for leakage.

- c. *Increase in the use of non-renewable biomass outside the project boundary to create non-renewable biomass baselines can also be potential source of leakage. If this leakage assessment quantifies an increase in use of non-renewable biomass outside the project boundary then B_y is adjusted to account for the quantified leakage.*

Based on web check of UNFCCC and national DNA website, there were no CDM project activities in the region under implementation after the registration of SEDS Biogas Project. Thus there is no increase in the use of non-renewable biomass outside the project boundary to create non-renewable biomass baselines to account for potential source of leakage. Thus there is no use of non-renewable biomass outside the project boundary which is being used as a baseline for another CDM project to adjust B_y to account for leakage.

According to the sample survey, the project activity does not lead to leakage. But to be conservative B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages (based on the latest version of I.E methodology Version 5).

Emissions from the use of fossil fuels for meeting similar thermal energy needs		
Activity Data	Value	ID Ref
Quantity of Biomass that is substituted after considering leakage (t/family/yr)	3.20	$B_{y-adjusting\ for\ leakage}$
Quantity of biomass that is substituted (t/yr) for the monitoring period after considering non-operational days (see CER Calculations.xlsx for details).	18,071	$B_{y-adjusting\ for\ leakage}$
Fraction of NRB	90%	$f_{NRB, y}$
NCV Biomass (TJ/t)	0.015	$NCV_{biomass}$
Emission factor Kerosene (tCO ₂ /TJ)	71.5	$EF_{projected_fossilfuel}$
Emission Reductions after discounting for non-operational days (tCO₂/yr)	17,443	ER_y

The total emission reductions for the monitoring period after considering leakage for the installed and operational 4,475 biogas units are shown in the excel sheet – CER Calculations.xlsx.

The Emission Reduction is 18,361. After considering leakage, the emission reduction is 17,443. This the leakage for the monitoring period is 18,361-17,443 = 918 tCO₂.

The total emission reductions after considering leakage for the period 1st May 2014 to 31st October 2015 for the installed 4,475 biogas units are 17,443 tCO₂.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	18,361	0	918	0	17,443	17,443

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO ₂ e)	24,463	17,443

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

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There was no increase in the actual emission reductions achieved during the current monitoring period. There was a decrease in the emission reductions achieved during the current monitoring period to that projected in the PDD as only 4,475 biogas units are commissioned and operational. The biogas units are being constructed in a phased manner during the year. There was also nearly 4% downtime of units due to repairs.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	SOCIAL EDUCATION AND DEVELOPMENT SOCIETY (SEDS)
Street/P.O. Box	Anandapuram, Peddamanthur SO,
Building	
City	Penakonda, Anantapur District
State/region	Andhra Pradesh
Postcode	515124
Country	INDIA
Telephone	+91 8555 245424
Fax	+91 8555 245436
E-mail	sedsnego@gmail.com
Website	www.sedsnego.org
Contact person	Mrs. Manil Jayasena Joshua
Title	CEO
Salutation	Mrs
Last name	Joshua
Middle name	Jayasena
First name	Manil
Department	
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Direct tel.	+91 8555 245424
Personal e-mail	maniljayasena@gmail.com

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input type="checkbox"/> Responsible person/ entity for completing the CDM-MR-FORM
Organization name	Evangelisches Werk für Diakonie und Entwicklung e.V.
Street/P.O. Box	
Building	Caroline-Michaelis-Str. 1
City	Berlin,
State/Region	
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Country	Germany
Telephone	+19 228 81012154
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Website	
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Salutation	
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First name	Tilman
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Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.

<i>Version</i>	<i>Date</i>	<i>Description</i>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		