



**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	Nairobi River Basin Biogas Project	
UNFCCC reference number of the project activity	6549	
Version number of the monitoring report	1.1	
Completion date of the monitoring report	16/07/2015	
Monitoring period number and duration of this monitoring period	1; 31/12/2012 – 30/12/2014	
Project participant(s)	Kenya (host): Sustainable Energy Strategies Ltd. (private entity) Germany: atmosfair gGmbH (private entity)	
Host Party	Kenya	
Sectoral scope(s)	1 : Energy industries (renewable - / non-renewable sources)	
Selected methodology(ies)	Methodology: AMS I.E. (version 04) Switch from Non-Renewable Biomass for Thermal Applications by the User	
Selected standardized baseline(s)	Not applicable	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	2013: 6,754 t CO ₂ 2014: 18,840 t CO ₂ Total: 25,594 t CO 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
	2 t CO ₂	2,846 t CO 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 or net anthropogenic GHG removals by sinks

The small-scale project activity aims to construct up to 10,000 domestic biogas units of mainly 2m³ and 3m³ gas storage capacities each for individual households of at least 2 zero-grazing cows in Nairobi River Basin. Beneficiaries will be mainly dairy farmers and members of rural dairy Saccos (Saving Credit Cooperatives).

The biogas units are fed with cow dung and produce renewable biogas for cooking and water heating purpose. The digesting process will also generate fertile slurry as a by-product, which can be used as manure for local agriculture (e.g. vegetable farming) and as regular income earning activity. The project activity is saving greenhouse gas emissions by replacing non-renewable biomass (mainly fuel wood and charcoal) with renewable biogas. The project activity will also replace fossil fuels (LPG and Kerosene). However, this will not be taken into account for conservativeness reasons.

Carbon revenues will be the only source of subsidy financing. The applied CDM Methodology is AMS I.E. (version 04).

- (b) Brief description of the installed technology and equipment

The technology to be employed is of the type "Deenbandhu model 2000", which is well known and widely implemented in India, i.a. in registered CDM projects. The model has been developed by the Indian NGO, Action for Food Production (AFPRO) since the 1970s. It is a fixed dome type, which combines durable quality with a lifetime of over fifteen years and cheap construction costs by using locally procured materials. Design of the model may develop over time.

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

Date	Milestone
21/08/2010	Conduction of GS Local Stakeholder Consultation in Kikuyu Hospital/Thogoto, Kiambu District
09/10/2010	Commissioning of first biogas plant in project area
28/06/2012	Registration date under UNFCCC
31/12/2012 – 30/12/2014	First Monitoring Period

- (d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period

Total: 2,848 t of CO_{2e}

A.2. Location of project activity

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- (a) Host party(ies)
Republic of Kenya

- (b) Region/State/Province

The project region Nairobi River Basin is situated in Central Province. The administrative border of the project activity is Kiambu county.

(c) City/Town/Community

Due to its nature (Domestic biogas), the project activity will be implemented in many locations within the administrative borders of Kiambu county at households willing to participate in the CDM project with at least two cows in their premises.

(d) Physical/ Geographical location

The coordinates of the first commissioned biogas units, located in Thogoto in the close proximity to Kikuyu town, are used to represent the physical location of the project activity:

Latitude: 1° 14' 45" S

Longitude: 36° 39' 55" E

The following districts and all settlements within these districts belong to Kiambu county:

Lari, Gatundu North, Gatundu, Thika West, Thika East, Limuru, Githunguri, Ruiru, Kiambu, Kabete

It will be ensured that each biogas unit can be uniquely identified by end user agreements where name and contact details are provided.

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)
Kenya (host)	Sustainable Energy Strategies Ltd. (Private entity A)	No
Germany	atmosfair gGmbH (Private entity B)	No

A.4. Reference of applied methodology and standardized baseline

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AMS-I.E.: Switch from non-renewable biomass for thermal applications by the user (Version 4.0)

UNFCCC

link:

<https://cdm.unfccc.int/methodologies/DB/WHTQUFLWCVNB9CIUZC198A712WGQR4>

A.5. Crediting period of project activity

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Fixed crediting period (10 years)

Start date of crediting period: 31/12/2012

End date of crediting period: 30/12/2022

A.6. Contact information of responsible persons/entities

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Entity responsible for completing the CDM-MR-Form:

atmosfair gGmbH

Zossener Str. 55-58

10961 Berlin

Germany

Sven Bratschke

Tel: +49 (0)30 6273550-16

Email: bratschke@atmosfair.de

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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a) Description of installed technology(ies), technical processes and equipment

The Deenbandhu domestic biogas model was designed by Action for Food Production (AFPRO, <http://www.afpro.org>), an Indian socio-technical non-governmental organization working for the development of the rural poor through effective natural resource management solutions. AFPRO developed several domestic biogas digester types since the 1970s. In year 2000 AFPRO improved the fixed dome Deenbandhu model to finally promote Deenbandhu model 2000:

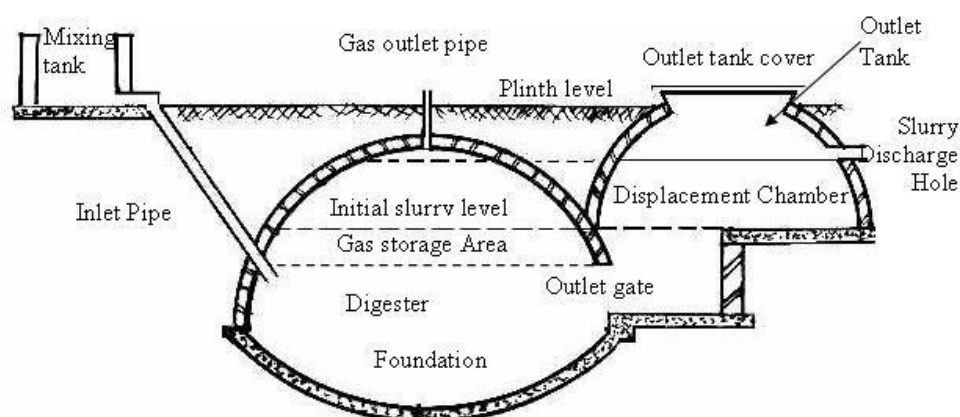


Figure 1: Indicative design of Deenbandhu model 2000 (Source: AFPRO)

The biogas units are connected to biogas burners for cooking. Except for the gas burner, all building material for the biogas digester (bricks, cement and sand) can be sourced locally. The main components of the Deenbandhu 2000 Biogas model¹ are:

Foundation:

The foundation of the plant is bowl shaped with a collar around the circumference. The construction of the digester dome is done on this collar.

Dome:

The dome of the digester is divided in two parts, digester and gas storage.

Digester: The bottom part is called digester. The mixture of dung and water decomposes in this part and produces gas due to bacterial activity.

Gas storage: The upper part of the digester dome is called gas storage. The gas produced by the bacterial activity is stored in this place.

Gas outlet pipe:

A nipple is fitted on the top of the dome, which is connected to a pipe. The gas reaches the kitchen through this pipe. The recovered gas is combusted and used on a biogas burner for cooking in the household.

Inlet:

¹ Indicative description; design of the model may change over time

The pipe through which fresh dung and water enters the plant is called Inlet pipe. This pipe is connected to a small tank for mixing dung and water.

Outlet:

The portion of the plant where the slurry accumulates after coming out of the digester is called outlet tank. It is in two parts. The first bottom part is small and rectangular, which is connected to the dome opening, while the other part of outlet tank is dome shaped. A small slurry discharge hole is provided in the outlet tank.

Plant size (Gas storage)	Dung to be fed into the digester (kg)	Water to be fed into the digester (liter)	Number of cows per household	Number of eaters per household
2m ³	50	50	min 2	5-8
3m ³	75	75	min 3	9-15

b) Information on implementation status of the project activity during monitoring period

The first biogas unit in the project was commissioned on 09 October 2010. According to the sales records and the database of the project, a total of 457 biogas units were constructed, commissioned and in operation at the end of the first monitoring period (30/12/2014) in the project area.

The project is implemented in accordance with the provisions in the PDD. However, it needs to be underlined that the number of commissioned biogas units largely differs from the numbers stated in the PDD due to several reasons such as the relatively high costs for the biogas units. In order to maximize the construction and commissioning of new biogas units, project participants designed new finance mechanisms to support and fasten the construction of new units.

c) Description of:

(i) The events or situations that occurred during the monitoring period that may impact the applicability of the applied methodology;

No special events which may impact the applicability of the methodology occurred.

(ii) How the issues resulting from these events or situations have been addressed.

Not applicable

d) Request for prior approval

No request for prior approval by the Board of changes to the registered SSC project has been submitted.

B.2. Post-registration changes

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

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No temporary deviations from registered monitoring plan or applied methodology have been applied during this monitoring period.

B.2.2. Corrections

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No corrections to project information or parameters fixed at validation have been approved during this monitoring period or submitted with this monitoring report.

B.2.3. Changes to start date of crediting period

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A revision of the start date of the crediting period was requested by the project participant to the UNFCCC secretariat at the 8th of July 2013. The start date of the crediting period was subsequently changed to: 31 December 2012.

The start date is already adjusted on the UNFCCC website:

<http://cdm.unfccc.int/Projects/DB/RWTUV1340886479.47/view>

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

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No further monitoring plan was included to the registered PDD, which was not included at the time of registration.

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

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No permanent changes to the monitoring plan or applied methodology of the project activity have been approved during this monitoring period or submitted with this monitoring report.

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

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No changes to the project design of the project activity have been approved during this monitoring period or submitted with this monitoring report.

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

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Not applicable.

SECTION C. Description of monitoring system

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Data collection procedures and organisational structure

The monitoring consists of three stages:

1. (Continuous) Sales monitoring to determine N_y
2. Sample surveys to determine DO_y
3. Data compilation, quality control and drafting of the Monitoring Report

1. Sales Monitoring

Sales monitoring serves to determine the adjusted total number of biogas units commissioned until period y (Ny). The process of biogas unit commissioning and sales monitoring data flow incl. organisational structure is illustrated in the following diagram

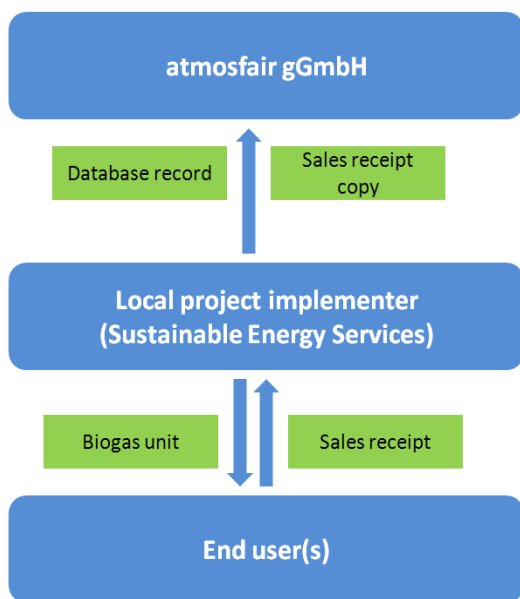


Diagram one: Sales monitoring flow chart

Data generation:

Every end user acknowledges the purchase and conditions of usage of the biogas unit on a sales receipt. The sales receipt provides information on:

- Type of biogas unit constructed (2m³ or 3m³)
- GPS coordinates of biogas unit
- Commissioning date of appliance
- Date of signature of end user agreement
- User details (Name, location, telephone number etc.)
- Implementing Entity/ Contact Person
- Paid price and amount of subsidy

Data recording:

The data manager or representative of SES collect the sales receipts from the end users and enter the information from the sales receipts into an electronic database (the “sales records database”).

Data aggregation and reporting:

The data manager of SES submit both, copies of the sales receipt and the electronic datasets from the sales receipts to atmosfair. atmosfair checks for inconsistencies and instructs distributors to take corrective action if necessary.

2. Sample surveys

Sample surveys are conducted that serve to determine the

- Statistically adjusted drop out from total population of appliances in period y (DOy)

The sample survey data flow incl. organisational structure is illustrated in the following line diagram



Diagram two: Sample survey flow chart

Data generation:

atmosfair draws a random sample from the sales records database and submits the electronic sample incl. user details to the monitoring team. The monitoring team conducts the surveys (user interviews) at the end user locations.

The first monitoring period (31/12/2012 – 30/12/2014) covers the first two years of the overall crediting period. Two annual monitoring campaigns were conducted within the first monitoring period.

The random sample for the first annual monitoring campaign (Monitoring Campaign 1) was drawn on the 18/03/2014 on the basis of all biogas units commissioned (n,i) until the 30/12/2013. Interviews for this campaign were conducted between 01/04/2014 and 26/04/2014.

The random sample for the second annual monitoring campaign (Monitoring Campaign 2) was drawn on the 16/03/2015 on the basis of all biogas units commissioned (n,i) until the 30/12/2014. Interviews for this campaign were conducted between 28/03/2015 – 26/05/2015.

Results from both campaigns are used for the calculation of emission reductions for the first monitoring period (31/12/2012 – 30/12/2014) and are shown separately within the presented monitoring report.

Data recording:

The monitoring team records the information from the user interviews on questionnaires.

Data aggregation and reporting:

The monitoring team submits the questionnaires and the data entry forms to atmosfair. atmosfair checks for inconsistencies and instructs the monitoring team to take corrective action if necessary. atmosfair aggregates and reports the results in an inspection database.

For the detailed sampling plan, see Section D.3.

3. Data compilation, quality control and drafting of the Monitoring Report

atmosfair finally transfers the parameter values from the sales records database and from the inspection database to an Excel spreadsheet containing the equations to calculate the emission reductions of the monitoring period. The achieved values are reported in the monitoring report.

Roles and responsibilities of personnel

Person	Role
Managing entity database manager	The database manager is responsible for updating and maintaining all electronic databases
Monitoring team	The monitoring team will be assigned by the project participants to

	conduct the user interviews during the periodic sampling and reports the results to the database manager
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Emergency procedures for the monitoring system

atmosfair has implemented a system of cross-checks to ensure data quality. There is a separation of roles for every step of the data generation, aggregation & recording, calculation and reporting between those who are responsible and those who are controlling the respective step. In particular, the database manager of atmosfair checks correctness and consistency between information on the sales receipts and the corresponding sales database record. In case inconsistencies are detected, the database manager instructs the representative of SES or the database manager to search for the error source. If the error source can be found, the information is corrected accordingly, if not, the database record is removed from the database.

Furthermore, the database manager of atmosfair checks the correctness and consistency of all sampling data collected and processed in this Monitoring Period.

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)

Data/parameter:	<i>By (net per unit)</i>
Unit	tonnes/year/household
Description	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tonnes
Source of data	Ministry of Energy: STUDY ON KENYA'S ENERGY DEMAND, SUPPLY AND POLICY STRATEGY FOR HOUSEHOLDS, SMALL SCALE INDUSTRIES AND SERVICE ESTABLISHMENTS (Final Report, 2002, prepared by Kamfor Ltd.)
Value(s) applied)	4.257
Choice of data or measurement methods and procedures	Quantity of fuelwood and charcoal was determined using official, historical data and cross checked with results from a baseline survey carried out by atmosfair and SES and reviewed by independent third party. See Section B.6.1 for details. By (gross per unit) is multiplied with a net to gross adjustment factor LE_{NRB} of 0.95 to account for leakages as per AMS I.E., v.4: $B_y (netperunit) = B_y (grossperunit) \bullet LE_{NRB}$
Purpose of data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	This is a fixed value throughout the crediting period.

Data/parameter:	$f_{NRB,y}$
Unit	Percent
Description	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non renewable biomass using survey methods
Source of data	FAO (Forest Resource Assessment 2010)
Value(s) applied)	0.962
Choice of data or measurement methods and procedures	In the NRB assessment using FAO data for each type of forest or non-forest area, it was found that in most areas the DRB conditions as per the methodology are not fulfilled. Areas where the growing stock has increased were counted as renewable sourcing areas. See Section B.6.1 for details.

Purpose of data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	This is a fixed value throughout the crediting period.

Data/parameter:	NCV _{biomass}
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	AMS I.E., ver. 4
Value(s) applied)	0.015
Choice of data or measurement methods and procedures	This is a default value as per AMS I.E., ver. 4, par. 5.
Purpose of data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	This is a fixed value throughout the crediting period.

Data/parameter:	EF _{projected_fossilfuel}
Unit	tCO ₂ /TJ
Description	Emission factor for substitution of non renewable woody biomass by similar consumers.
Source of data	AMS I.E., ver. 4 (default value)
Value(s) applied)	81.6
Choice of data or measurement methods and procedures	This is a default value as per AMS I.E., ver. 4, par.
Purpose of data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comments	This is a fixed value throughout the crediting period.

D.2. Data and parameters monitored

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

Data/parameter:	N_y
Unit	Number
Description	Adjusted total number of biogas units deployed until monitoring period y of end users who confirmed that non-renewable biomass was displaced/substituted
Measured/calculated/default	Calculated
Source of data	End user agreements
Value(s) of monitored parameter	Monitoring Campaign 1: 223 Monitoring Campaign 2: 365
Monitoring equipment	Sales receipts and sales record database
Measuring/reading/recording frequency:	Continuous monitoring and recording of N _i

Calculation method (if applicable):	<p>The total number of units commissioned until period y is calculated from the end user agreements where owner and location of the biogas unit is stated.</p> $N_{i,y} = \sum_{j=1}^y n_i \cdot OT_{adjusted,i,y}$ <table border="1"> <thead> <tr> <th>Parameter</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>n_i</td> <td>Number of units commissioned in period i as documented by end user agreements and reported</td> </tr> <tr> <td>$OT_{adjusted,i,y} = \begin{cases} 1 & , i < y \\ \frac{d_{average,y}}{mp_{length}} & , i = y \end{cases}$</td> <td>Adjustment factor for reduced operational time of appliances deployed in period y</td> </tr> <tr> <td>$d_{average,y}$</td> <td>Average number of days that appliances deployed in period y have been operational in period y as determined by respective commissioning dates (from end user agreement) of units counted for n_y.</td> </tr> <tr> <td>mp_{length}</td> <td>Length of monitoring period y</td> </tr> </tbody> </table>	Parameter	Description	n_i	Number of units commissioned in period i as documented by end user agreements and reported	$OT_{adjusted,i,y} = \begin{cases} 1 & , i < y \\ \frac{d_{average,y}}{mp_{length}} & , i = y \end{cases}$	Adjustment factor for reduced operational time of appliances deployed in period y	$d_{average,y}$	Average number of days that appliances deployed in period y have been operational in period y as determined by respective commissioning dates (from end user agreement) of units counted for n_y .	mp_{length}	Length of monitoring period y
Parameter	Description										
n_i	Number of units commissioned in period i as documented by end user agreements and reported										
$OT_{adjusted,i,y} = \begin{cases} 1 & , i < y \\ \frac{d_{average,y}}{mp_{length}} & , i = y \end{cases}$	Adjustment factor for reduced operational time of appliances deployed in period y										
$d_{average,y}$	Average number of days that appliances deployed in period y have been operational in period y as determined by respective commissioning dates (from end user agreement) of units counted for n_y .										
mp_{length}	Length of monitoring period y										
QA/QC procedures:	Data will be collected using the standard procedures as described in an internal Monitoring Manual and will be stored for the crediting period and an additional two years										
Purpose of data:	Baseline emission calculations										
Additional comments:											

Data / Parameter:	DO_y
Unit:	%
Description:	Statistically adjusted drop out from total population of units in period y
Measured/Calculated/Default:	Calculation from sample survey
Source of data:	Primary data collection: dedicated monitoring team
Value(s) of monitored parameter:	Monitoring Campaign 1: 3.33 Monitoring Campaign 2: 3.33
Monitoring equipment:	Questionnaire
Measuring/Reading/Recording frequency:	Two annual monitoring campaigns have been conducted within this monitoring period

Calculation method (if applicable):	<p>Monitoring of the statistically adjusted drop out involves two steps:</p> <p>Step 1: Sample survey amongst units deployed as specified in section B.7.2</p> <p>Step 2: Calculation of the adjusted drop out rate at confidence level and precision as required by the methodology (AMS I.E. v.4) for the inspection frequency chosen.</p> <p>The Drop outs will be determined through spot checks and interviews where it will be checked if the units have been operational during the monitoring period, performed by a dedicated monitoring team according to the sampling procedure described in section B.7.2. Substitution of non-renewable biomass will also be checked. Interviews will be reported in a questionnaire.</p> <p>Checks are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the head of the monitoring team that takes care of entering the information to an electronic database.</p> <p>All formulas applied to determine the statistical precision used are standard formula. Furthermore, according to AMS I.E., v. 4, par.17 the sampling error has to be deducted (“...the lower bound of a [...] confidence interval of the parameter value may be chosen”) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made, if the precision is achieved by sampling a proper number of units.</p>
QA/QC procedures:	<p>Data will be collected using the standard procedures as described in an internal Monitoring Manual and will be stored for the crediting period and an additional two years.</p> <p>A traceable “identity check” of the units visited during sampling shall be performed and recorded (e.g. a picture of the biogas unit).</p>
Purpose of data:	Baseline emission calculations
Additional comment:	

D.3. Implementation of sampling plan

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a) Description of implemented sampling design

According to AMS I.E. ver. 4, par. 12, ‘*Monitoring shall consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating or are replaced by an equivalent in service appliance.*’

Furthermore, according to par. 14, monitoring shall ensure that:
Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location. In the case of appliances switching to renewable biomass the quantity of renewable biomass used shall be monitored.

For this reason, parameters as stated in Section D.2. of this Monitoring Report are monitored. Due to the high number of units to be deployed an annual check of all units may not be economically feasible and therefore a sample may be monitored to ensure that all the units deployed are still operating or to record end of operation and/or replacement of the units in order to determine the statistically adjusted annual or biennial value for drop out (**DO_y**). Where replacements are made, monitoring shall also ensure that they are replaced by an equivalent in service appliance.

Two annual monitoring campaigns were conducted within the first monitoring period (31/12/2012-30/12/2014). The first monitoring campaign (Monitoring Campaign 1) (31/12/2012-30/12/2013) was

based on all biogas units commissioned until the 30/12/2013 and included in the database. The second monitoring campaign (Monitoring Campaign 2) (31/12/2013-30/12/2014) was based on all biogas units commissioned until the 30/12/2014 and included in the database.

Samples were drawn from the project’s database of atmosfair via a computerized random sample. The random sample for the first annual monitoring campaign was drawn on the 18/03/2014. The random sample for the second annual monitoring campaign was drawn on the 16/03/2015.

N_y was monitored through sales records for all biogas units commissioned until a specific date for the respective monitoring campaigns (30/12/2013 for Monitoring Campaign 1 or 30/12/2014 for Monitoring Campaign 2). The parameter of DO_y was determined through sample surveys.

The required sample size for DO_y was calculated prior to conducting the sample surveys using the equations for simple random sampling as per EB 67 Annex 6, para 16 to 26. However, since the calculated sample sizes were relatively low, the minimum sample size of 30 biogas units per sample as defined in the PDD were monitored. Therefore, the total number of conducted interviews for the first monitoring period is 60. Interviews for Monitoring Campaign 1 were conducted between 01/04/2014 – 26/04/2014, whereas interviews for Monitoring Campaign 2 were conducted between 28/03/2015 – 26/05/2015.

Results from both monitoring campaigns are used for the calculation of emission reductions for the first monitoring period (31/12/2012 – 30/12/2014) and are shown separately within the present monitoring report.

Precision requirements:

As per applicable methodology AMS-I.E., ver. 4, par. 17: *‘when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/5 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/5 precision’*

Since project proponents chose to inspect annually, a 90% confidence interval and a 10% margin of error requirement are applicable for both monitoring campaigns under the first monitoring period.

- b) Collected data, analysis and demonstration on whether the required confidence/precision has been met

Monitoring campaign 1: 31/12/2012 – 30/12/2013

Parameter	n*	Value	Standard deviation	Confidence	Precision	Lower bound applicable?
DO_y	30	3.33%	N/A	90%	5.29%	No

*valid responses

Monitoring campaign 2: 31/12/2013 – 30/12/2014

Parameter	n*	Value	Standard deviation	Confidence	Precision	Lower bound applicable?
DO_y	30	3.33%	N/A	90%	5.39%	No

*valid responses

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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Please note that the methodology AMS I.E., ver. 4 does not provide specific equations for calculation of Baseline emissions, project emissions or leakage, only for Emission reductions. As Leakage was considered ex-ante, B_y was adjusted to account for the quantified leakage (see also E.3.).

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

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Not applicable, as methodology AMS I.E., ver. 4 does not consider project emissions.

E.3. Calculation of leakage

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As per AMS-I.E., ver. 4 par. 10, leakage has to be considered to adjust B_y . In line with the methodology, B_y is therefore multiplied ex-ante by a net to gross adjustment factor LE_{NRB} of 0.95 to account for leakages. Therefore, leakage emissions are considered in the baseline emissions calculation and do not need to be considered during monitoring.

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	2,848	Not applicable	Not applicable	2	2,846	2,848

In line with the AMS I. E., ver. 4, emission reductions are calculated using the following equation:

Emission Reductions are calculated as:

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

$$B_y = N_y \bullet B_y (\text{netperunit}) \bullet (1-DO_y)$$

Therefore:

$$ER_y = N_y \bullet B_y (\text{netperunit}) \bullet (1-DO_y) \bullet f_{NRB,y} \bullet NCV_{biomass} \bullet EF_{projected_fossilfuel}$$

Parameter	Unit	Type	Description
ER_y	tCO ₂ e	Calculated	Emission reductions during the year y in tCO ₂ e
N_y	-	Measured	Adjusted total number of biogas units deployed until year y of end users who confirmed that non-renewable biomass was displaced/substituted
DO_y	%	Monitored	Statistically adjusted drop out from total population of units in period y
$B_y (\text{netperunit})$	tons/year/household	Calculated	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tonnes
$f_{NRB,y}$	%	Fixed	Fraction of non renewable woody biomass used in the absence of the project activity in year y
$NCV_{biomass}$	TJ/t	Fixed	Net calorific value of the non-renewable woody biomass that is substituted
$EF_{projected_fossilfuel}$	tCO ₂ /TJ	Fixed	Emission factor for substitution of non renewable woody biomass by similar consumers

Notes:

1. AMS I.E., ver. 4 offers two options for determining B_y . Project participants chose option a) of para 6: (a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); this being expressed in the term: $N_y \bullet B_y (\text{netperunit})$

2. Furthermore, AMS I.E., ver.4, para 12 requires checking all or a representative sample of appliances to ensure that they are still operating. This is expressed in parameter DO_y and considered in the calculation of B_y .

3. The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy source (para 10a of AMS I.E., ver.4) is addressed by the net to gross adjustment factor of 0.95. Therefore, By (*netperunit*) is calculated according to the following formula:

$$By \text{ (netperunit)} = By \text{ (grossperunit)} \bullet LE_{NRB}$$

Parameter	Unit	Type	Description
By (<i>netperunit</i>)	Tons/year/household	Fixed	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tonnes (including potential leakage)
By (<i>grossperunit</i>)	Tons/year/household	Fixed	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tonnes
LE_{NRB}	-	Fixed	0.95 default value

Monitoring Campaign 1: 31/12/2012 – 30/12/2013

Parameter	Unit	31/12/2012 – 30/12/2013	Sources
By (<i>grossperunit</i>)	t/a	4,482	Fixed ex-ante - PDD
LE_{NRB}	-	0,95	Fixed - AMS I.E., ver. 4
By (<i>netperunit</i>)	t/a	4,257	Calculated
N_y	-	223	Calculated
Doy	%	3,33%	Monitored
By	t/a	917,70	Calculated
$f_{NRB,y}$	fraction	0,962	Fixed ex-ante - PDD
$NCV_{biomass}$	TJ/t	0,015	Fixed ex-ante - PDD
$EF_{\text{projected fossilfuel}}$	t CO ₂ /TJ	81,6	Fixed ex-ante - PDD
ER_y	t CO₂	1.080	Calculated

Monitoring Campaign 2: 31/12/2013 – 30/12/2014

Parameter	Unit	31/12/2013 - 30/12/2014	Sources
By (<i>grossperunit</i>)	t/a	4,482	Fixed ex-ante - PDD
LE_{NRB}	-	0,95	Fixed - AMS I.E., ver. 4
By (<i>netperunit</i>)	t/a	4,257	Calculated
N_y	-	365	Calculated
Doy	%	3,33%	Monitored
By	t/a	1502,06	Calculated
$f_{NRB,y}$	fraction	0,962	Fixed ex-ante - PDD
$NCV_{biomass}$	TJ/t	0,015	Fixed ex-ante - PDD
$EF_{\text{projected fossilfuel}}$	t CO ₂ /TJ	81,6	Fixed ex-ante - PDD
ER_y	t CO₂	1.768	Calculated

Total emission reductions 1. Monitoring Period

ER (up to the 31/12/2012)	t CO2	2
ER (01/01/2013-30/12/2014)	t CO2	2.846
ER (31/12/2012 – 30/12/2014)	t CO2	2.848

Table1: Summary of Emission reductions of the First Monitoring Period

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 _{2e})	25,594	2,848

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

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In the registered PDD, expected annual emission reductions for both years, 2013 and 2014, are 25,594t CO₂. The actual values achieved during this monitoring period are lower than estimated in the registered PDD.

The main reason for the difference is the number of commissioned biogas units during this monitoring period, which is lower than the estimate within the PDD. Project participants assumed at the point of validation a faster development and commissioning of biogas units which was the basis for ex-ante calculation.

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 checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	atmosfair gGmbH
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Mobile	
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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
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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.
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.
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