CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at: http://cdm.unfccc.int/Reference/Documents
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Nairobi River Basin Biogas Project
PDD Version: 2.4
Date of completion: 11/06/2012

A.2. Description of the small-scale project activity:

Purpose of the project activity

The small-scale project activity aims to construct up to 10,000 domestic biogas units of mainly $2m^3$ and $3m^3$ gas storage capacities each for individual households of at least 2 zero-grazing cows in Nairobi River Basin. The geographical focus of the project activity is Kiambu County [1], northwest of Nairobi City. 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).

Technology to be employed

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.

Measures undertaken as part of the project activity

The project activity is implemented by the Kenyan company Sustainable Energy Strategies Ltd. and the German non-profit carbon offset organisation atmosfair gGmbH.

[1] Former Kiambu district. New administration borders since 27.08.2010

A pilot phase started in June 2010 in which 30 biogas units were constructed until November 2010 and tested for several months. Furthermore, local masons and artisans were trained by trainers seconded from AFPRO. Training of artisans by experienced masons will continue during the project implementation.
A baseline survey on fuel consumption and manure production was carried out in July / August 2010 and a Stakeholder Consultation meeting held in August 2010.

The progress in number of installations depends on the demand of the farmers as well as the capacity of the implementers. However, Emission Reductions in this PDD are calculated based on the following indicative schedule:

Year	Number of newly built biogas units*
2012	125
2013	1,250
2014	2,500
2015	3,000
2016	3,125

Table 1: Number of Biogas units between 2012-2016
* i.e. commissioned before start of the respective year/ start of crediting period

Contribution to sustainable development

Besides saving greenhouse gases, the project helps to:

- bring wood consumption down so as to allow natural recovery of forests and/or reforestation to take place
- diminish Indoor Air Pollution from wood smoke and to avoid its harmful health consequences
- reduce household expenses on cooking energy
- create qualified jobs through training of e.g. local artisans
- generate fertile slurry as a by-product, which can be used as manure for local agriculture (e.g. vegetable farming)

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Kenya (host)	Sustainable Energy Strategies Ltd. (private entity)	No
Germany	atmosfair gGmbH (private entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Table 2: Project participants

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Republic of Kenya

A.4.1.2. Region/State/Province etc.:

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

A.4.1.3. City/Town/Community etc:

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.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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. Furthermore, if reasonable possible, the GPS location will also be recorded.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project falls under the Appendix B of the simplified modalities and procedures for small scale CDM project activities and uses the methodology:

- AMS I.E.: Project type: Type I. RENEWABLE ENERGY PROJECTS, Project Category: Category I.E. - Switch from non-renewable biomass for thermal applications by the user (ver. 4)

as available under http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

Description of how environmentally safe and sound technology and know how is being applied by the project activity:

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:

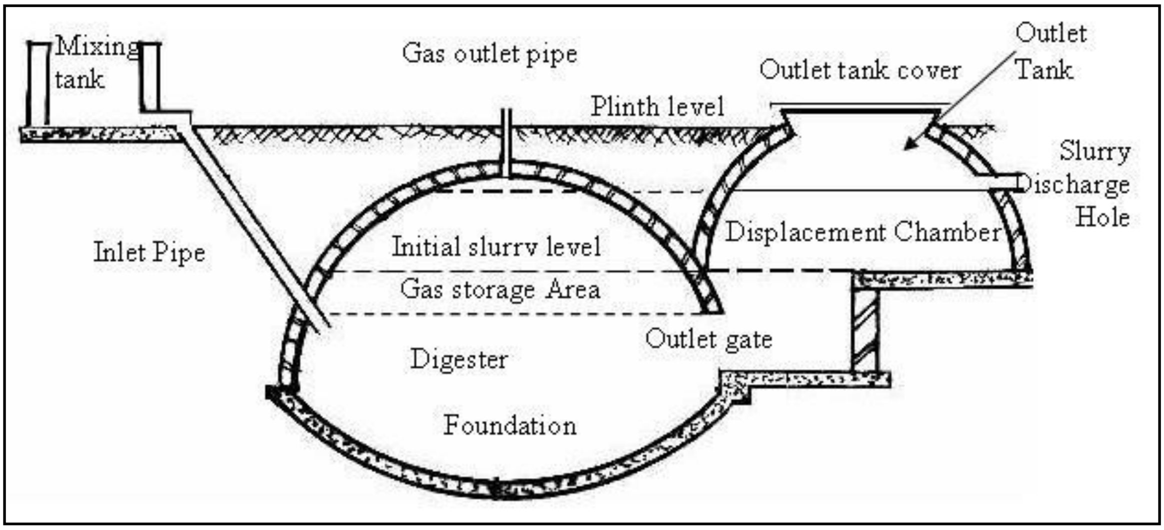

Figure 1: Indicative design of Deenbandhu model 2000 (Source: AFPRO)

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 model[2] 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:

[2] Indicative description; design of the model may change over time

The dome of the digester is divided in 2 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:
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 (litre)	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

Table 3: Biogas requirements for households (Indicative figures only)[3]

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The following table shows the total estimated emission reductions over the chosen CDM crediting period of 10 years

Years	Estimation of annual emission reductions in tones of CO_2e
01.07.2012-31.12.2012	310
2013	6,754
2014	18,840
2015	33,082
2016	47,619
2017	47,118
2018	46,616

[3] Figures adjusted from AFPRO: Manual on Deenbandhu Biogas Plant (submitted to DOE), page 48

2019	46,115
2020	45,614
2021	45,113
01.01.2022-30.06.2022	22,305
Total estimated emission reductions (tonnes of CO_2 e)	359,486
Total number of crediting years	**10**
Annual average of the estimated reductions over the crediting period (tCO_2 e)	35,949

A.4.4. Public funding of the small-scale project activity:

The German Ministry of Environment, under its CDM-JI Initiative, supported the establishment of the PDD documentation. In addition, the German Ministry provided funding for the establishment of the baseline survey, training of masons and construction of pilot units during the pilot phase (June 2010 to November 2010).

Official Development Assistance is not being diverted to the implementation of this project activity as the funding was not provided on condition of Germany purchasing the credits from this project.

After the end of the pilot phase in November 2010, there was no other public funding of the project activity. All subsidies for the project are stemming from CDM revenues.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

As per EB 54, Annex 13, the proposed small-scale project activity is not a debundled component of a large scale project activity, as there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The proposed small-scale CDM project activity is among the first CDM project activities in Kenya and the first one applying small-scale methodology AMS I.E.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

The project activity applies AMS. I.E., Version 04 (Switch from Non-Renewable Biomass for Thermal Applications by the User)

B.2 Justification of the choice of the project category:

As per General Guidelines to SSC CDM methodologies, ver. 17, EB 61, Annex 21, par. 4c, "*For thermal applications of biomass, biofuels or biogas (e.g. the cookstoves), the limit of 45 MWth is the installed/rated capacity of the thermal application equipment or device/s (e.g. biogas stoves)".*

Demonstration that the total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal:

Thermal Capacity Calculations				
$E = \eta * Hb * Q * N$				
Activity Data	**Value**	**Unit**	**Parameter**	**Source**
Combustion efficiency of burners	60	Percent	η	Manufacturer Specification (Rupak)
Heat of combustion per unit volume of biogas	22.1	MJ/m^3	*Hb*	B.T. Nijajuna 2002[4]
Burner rating	0.90	m^3/h	*Q*	Manufacturer Specification (Rupak)
Unit Conversion rate MJ -> kWh	0.278	-	-	-
Thermal Capacity per unit per day	**3.32**	**kW**	***E***	**Calculated**
Total number of units installed	10,000	-	N	Project Objective
Total Thermal Capacity	**33.20**	**MW**	***E***	**Calculated**

Table 4: Thermal capacity calculations

Project category I.E. (v 4) is applicable as the project activity:

The applicable conditions for AMS I.E.	Applicable to project activity?	Proposed project activity
Small-scale project requirement criterion	Yes	Project activity remains under 45 MW thermal as shown above

[4] Nijajuna, B. T. (2002): Biogas Technology. New Age International Publishers. New Delhi.

AMS I.E., par. 1.This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).	Yes	Project activity displaces use of non-renewable biomass by introducing biogas digesters and stoves, i.e. a renewable energy technology.
AMS I.E., par. 2: Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	Yes	Fuelwood and charcoal have been used by households in Kiambu county for a very long time, at least since year 1989 (see Section B.6.1)

B.3. Description of the project boundary:

In line with AMS I.E., the project boundary is the site of the use of biomass, which is the physical site of the biogas units.

	Source	Gas	Included?	Justification/ Explanation
Baseline	Combustion of non-renewable woody biomass for cooking, Emission factor for the substitution of non-renewable woody biomass by similar consumers	CO_2	Yes	Major source of emissions
		CH_4	No	Methane emissions from anaerobic storage of manure are excluded for simplification.
		N_2O	No	Excluded for simplification.
Project activity	Combustion of renewable biogas for cooking	CO_2	No	Excluded as emissions from animal waste are CO_2-neutral
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.

B.4. Description of baseline and its development:

The baseline scenario is the situation, where, in the absence of the project activity, fossil fuels and non-renewable biomass are used for meeting similar thermal energy needs. For the detailed baseline development, and methodological approach for baseline emissions, project emissions, leakage and emission reductions please refer to Section B.6.1. Please note that for simplification, fossil fuel use

which is prevalent in the baseline scenario was excluded in the calculation of emission reductions. This is conservative since the accounting of fossil fuel use would have led to higher emission reductions.
A report (p. 9 ff.) from 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; in the following referred to as "Kamfor report") shows that firewood is the most commonly used fuel in rural areas; charcoal use is also widespread; further fuels which are also used are Kerosene and LPG, but Kerosene is mainly used for lighting.
Furthermore, a baseline survey carried out by atmosfair and SES (and reviewed by Kenyan consulting firm BTA Ltd Consultants) in the project area in July/August 2010 showed that the overall majority of dairy farmers are using fuelwood as a source of cooking energy; a large share of users are using charcoal; and LPG use and Kerosene is also used by some households. Hence, the baseline scenario holds also true for the project area.
The baseline survey report was submitted to the DOE. Note: Baseline parameters are not referring to the baseline survey but are determined using external official historical data (see Section B.6.1).

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

The additionality of the proposed project activity is demonstrated using the criteria outlined in Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities. While Project Participants are aware that the "Tool for the demonstration and assessment of additionality" (v6.0.0, EB 65) is only mandatory for large-scale projects, it is voluntarily applied in order to improve the clarity of the additionally assessment.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations
The output of the project activity consists of thermal energy from a renewable source that is used by users for cooking.

Sub-step 1a. Define alternatives to the project activity

Alternative scenario 1:
Project activity implemented as Non-CDM

Alternative scenario 2:
Continuation of current situation: Non renewable woody biomass and fossil fuels would continue to supply thermal energy for the users (baseline scenario).

Sub-step 1b. Consistency with mandatory laws and regulations

The alternative scenario "continuation of the current situation" is a realistic and credible alternative to the project scenario, since the use of woody biomass and fossil fuels for cooking is not against the laws and regulations of Kenya.

Next step:

According to the tool, Project participants can use either investment analysis (step 2) or barrier analysis step (step 3). They may, if they so wish, use both investment and barrier analysis step. Therefore, instead of an investment analysis, a barrier analysis is conducted.

Step 3: Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed CDM project activity without CDM

The latest "Guidelines for objective demonstration and assessment of barriers" (EB 50, Annex 13) were taken into account when applying this step.

- Investment Barriers

According to the tool, investment barriers are

- *"For alternatives undertaken and operated by private entities: Similar activities have only been implemented with grants or other non-commercial finance terms. Similar activities are defined as activities that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant country/region;"*

Assessment:
There is no commercial market for domestic biogas having gained any significant foothold in the country so far. According to a study commissioned by Shell Foundation around 2,000 biogas units were constructed in Kenya over the last decades, "though it is impossible to estimate what percent remain in working condition due to the dispersed and sometimes uncontrolled and informal nature of installations"[5]. Given a population of 38,610,097 in the 2009 census[6] and estimating very conservatively a household size of 10, penetration of biogas technology at household level would only be 0.05%, even if all biogas units were to function. Similar activities – installation of domestic biogas units - have only been implemented in a noteworthy amount with grants in the context of development programmes. According to a study by Shell Foundation, the history of biogas in Kenya and its relation to governmental or NGO activities is as follows:

"Mr. Tim Hutchinson built the first biogas digester in Kenya in 1957. This provided all of the gas and fertiliser that his coffee farm needed. He found the effluent (or "sludge") an excellent fertiliser and that its application to his coffee trees greatly improved productivity. In 1958, he started constructing biogas digesters commercially, marketing the effluent as the main product with biogas as a useful by-product. Between 1960 and 1986, Hutchinson's company (called Tunnel Engineering Ltd.) sold more than 130 small biogas units and 30 larger units all over the country. Hutchinson biogas digesters (some still working after fifty years) can be found in various parts of Kenya, although mainly in the so-called high productive areas (Central and Western Kenya). Mr Hutchinson is retired, though still manufactures solar water heaters, and a limited number of biogas units. The German development organisation GTZ started promoting biogas in the middle to late 1980s in Kenya, in collaboration with the Ministry of Energy under the Special Energy Programme. In Kenya, the Special Energy Programme opted for the floating drum type, possibly because there was local steel manufacturing capacity. Approximately 400 biogas

[5]See for example: Biogas for Better Life (2007): Promoting Biogas Systems Kenya. A Feasibility Study (2007), p. 4ff., http://www.biogasafrica.org/index.php?option=com_docman&Itemid=16&lang=en, last accessed 18.02.2011

[6] See http://www.knbs.or.ke/Census%20Results/KNBS%20Brochure.pdf, last accessed 29.09.2011

units were built under the Special Energy Programme directly, though it is likely that the training and promotional activity spurred entrepreneur masons to build on an individual basis. Over the last fifty years, biogas technology has been promoted by national and international organisations (both Government and NGO) and they, together with trained Kenyan technicians have built hundreds of biogas digesters in the country. However, earlier evaluations showed that, unfortunately, a high proportion of digesters appear to operate below capacity, are dormant or in disuse after construction because of management, technical, socio-cultural and economic problems. Consequently, biogas technology has acquired a less favourable reputation and the penetration rate of biogas technology in the country remains very low. It is estimated that up to 2000 units have been installed in total, though it is impossible to estimate what percent remain in working condition due to the dispersed and sometimes uncontrolled and informal nature of installations. The majority of systems were installed in the 1980s and 1990s.” [7]

- *“No private capital is available from domestic or international capital markets due to real or perceived risks associated with investment in the country where the proposed CDM project activity is to be implemented, as demonstrated by the credit rating of the country or other country investments reports of reputed origin.”*

Assessment:
Kenya is rated B+ by rating agency Standard & Poors, which means investments are considered as “highly speculative”[8]. For S&P, a bond is considered investment grade if its credit rating is BBB- or higher. Bonds rated BB+ and below are considered to be speculative grade, sometimes also referred to as "junk" bonds[9]. According to World Bank Doing Business Global Ranking, in 2011 Kenya is the 98th best country to do business in the world[10]. Please note that major investment opportunities are seen in the agricultural, tourism, manufacturing, wholesale& retail, business process outsourcing and financial services sector, according to Kenya Investment Authority[11], whereas the proposed project activity is a household-based, multi-site (hence dispersed) biogas for cooking project, not fitting into one of these categories. However, due to the CDM incentive associated with this project, Sustainable Energy Strategies Ltd. (SES), a small start-up with so far limited resources (as evidenced by the DOE during the on site visit) could contract the carbon offset organization atmosfair gGmbH[12], providing upfront finance in return for future CERs. The future CER revenues are the only significant revenue stream for the investor atmosfair in the project. The Annex I party investor which could be secured at time of registration of this project (atmosfair gGmbH) however only provides upfront finance for the CDM related costs plus implementation costs and user subsidy[13] after entering into contractual relations with SES to ensure CERs will be generated and delivered to the investor[14]

[7] Biogas for Better Life (2007): Promoting Biogas Systems Kenya. A Feasibility Study (2007), p. 4ff., http://www.biogasafrica.org/index.php?option=com_docman&Itemid=16&lang=en, last accessed 18.02.2011

[8] Source: http://en.wikipedia.org/wiki/Credit_rating, last accessed 22.09.2011

[9] . Source: http://en.wikipedia.org/wiki/List_of_countries_by_credit_rating, last accessed 22.09.2011

[10] Source: http://www.doingbusiness.org/rankings, last accessed 22.09.2011

[11] Source: http://www.investmentkenya.com/index.php?option=com_content&task=view&id=133&Itemid=18, last accessed 22.09.2011

[12] For further information, please consult www.atmosfair.org. Annual report including financial statement can be downloaded there.

[13] As the objective of the proposed activity is to provide affordable, cost-effective biogas technology to users, they therefore receive a subsidy (projected to be around 100 Euro per unit) stemming from carbon finance, to lower the initial cost burden of the user. Note: The amount of subsidy which is paid to the end user may change over time and depends, i.a. from achieved emission reductions and the price carbon credits can be traded for. Therefore the only

Without the CDM scheme, the significant investment cost and development cost would have prevented SES from pursuing project implementation and the current system with high GHG emission would continue to be practiced.
The proposed project activity is hence facing tremendous investment barriers which could only be overcome by securing finance from companies with CDM experience which are able to assess the potential and risks of the CDM project activity and therefore provide risk capital to SES in order to enable SES to start implementing biogas units.

- Technological Barriers

According to the tool, technological barriers are:

- *"Skilled and/or properly trained labour to operate and maintain the technology is not available in the relevant country/region, which leads to an unacceptably high risk of equipment disrepair and malfunctioning or other underperformance;"*

atmosfair, being a CDM carbon offset organization which only finances CDM Gold Standard projects, is supporting a similar CDM registered biogas project in India, the Bagepalli CDM biogas programme. When contact with SES was established, it was atmosfair's interest to make a CDM project with domestic biogas also possible in Kenya. Since the technology design is from India, and despite other biogas initiatives there is a lack of skilled and/or properly trained labour to construct the specific Deenbandhu technology. For this reason, SES and atmosfair decided to second trainers from AFPRO to Kenya to train masons in construction of biogas units, the first time in July 2010 for a period of 2 months. In 2011, AFPRO trainers came for a second, long-term stay, financed upfront by the CDM investor atmosfair in return for future CERs[15]. The training and qualification of masons is an essential part of the CDM project, and incurs significant costs which cannot be covered by the users as the units must be affordable to them. Carbon finance provided upfront is hence also used to continue capacity building in the project area, and SES will continue to recruit trainers from AFPRO as required for project progress.

- *"Risk of technological failure: the process/technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed CDM project activity, as demonstrated by relevant scientific literature or technology manufacturer information;"*

The biogas technology, as it is not widespread in the country, has a high risk of technological failure compared to traditional cooking places and even modern technology such as LPG cookstoves.

From the experience made in Kenya so far, the main problems are[16]

- poor design and construction

relevant criteria for assessment is the fact that there is a subsidy stemming from carbon finance, regardless of its amount.

[14] See: Cooperation agreement/ Term Sheet between atmosfair and SES

[15] Evidence provided to the DOE

[16] GTZ (2009): Final Report. Analysis of the Market Potential for Domestic Biogas in Rural Kenya, p. 22. (Document provided to DOE)

- failures in the systems (functional units are operating below capacity)
- Inadequate support after installation
- lack of technology awareness
- missing standards/ lack of quality control (biogas digester system and operation requirements)

This again highlights the need for a mechanism such as the CDM which binds carbon finance to actual technological success, and thus overcomes the weaknesses of traditional development finance which did not create any incentives to follow up on the operations after the programme phased out after few years.

- Prevailing Practice

Prevailing practice is the use of firewood, charcoal, kerosene and LPG for cooking (the baseline scenario). Hence, end users are not changing from themselves to this new technology. The proposed project activity is the first carbon financed domestic biogas project in Kenya. See Step 4 for further assessment.

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives

- The identified barriers would prevent alternative scenario 1, project activity implemented as non-CDM, because the identified barriers can only be overcome by the CDM. Therefore, this alternative is removed from further consideration. However, the barriers would not prevent the alternative scenario 2, since the identified barriers only apply to the specific technology. For the traditional cooking with firewood, charcoal, Kerosene and LPG no such barriers exist, which is evident by the fact that they are widespread in the region and Kenya[17]

According to the tool,*" if both Sub-steps 3a . 3b are satisfied, proceed to Step 4 (Common practice analysis)."*

Step 4. Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

Requirement as per the tool:
"Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On

[17] 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). estimates regular firewood use by 67% of households in Kenya (89% of rural households), 47% of households are using charcoal, 92% Kerosene (mainly for lighting), and 8% LPG. (p. xiii)

the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region."

Analysis of other activities that are operational and similar to the proposed project acvtivity in terms of technology, scale, financial and regulatory environment:

There is no commercial market for domestic biogas having gained any significant foothold in the country so far. Similar activities have only been implemented with grants in the context of development programmes[18]. According to a study commissioned by Shell Foundation around 2,000 biogas units were constructed in Kenya over the last decades, "though it is impossible to estimate what percent remain in working condition due to the dispersed and sometimes uncontrolled and informal nature of installations"[19].

The main reasons for the slow uptake of the technology and its limited success are: [20,21]

- high costs of installing the systems
- lack of capacity to install high volumes of biogas (need to increase the number of technicians/artisans)
- high poverty is a constraint to shift from traditional to modern biomass energy utilisation
- lack of management/ maintenance (the absence of right instruction and information about maintenance and especially repair)
- lack of understanding by implementers about regional conditions and specific needs of the population (insufficient research to understand quality and end use issues)
- no sustainable and inadequate planning and monitoring by promoters (e.g. it has to be considered that enough organic material and water is required has to be available)
- Lack of trainings of constructors and farmers (necessity of correct construction works as well as correct maintenance by farmers)
- unregulated biogas sector
- poor quality of units

Further, PPs assessed EB 63, Annex 12, "Guidelines on Common Practice" but could not apply it since the technology targets households that are using the thermal energy for cooking in their premises, whereas EB63, Annex 12 refers to "commercial operation", which implies that the output (i.e. the biogas) is not used for subsistence, but for delivering/selling it to someone else.

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[18] See for example: Biogas for Better Life (2007): Promoting Biogas Systems Kenya. A Feasibility Study (2007), p. 4ff., http://www.biogasafrica.org/index.php?option=com_docman&Itemid=16&lang=en4ff., http://www.biogasafrica.org/index.php?option=com_docman&Itemid=16&lang=en, last accessed 18.02.2011

[19]IbidBiogas for Better Life (2007): Promoting Biogas Systems Kenya. A Feasibility Study (2007), p. 4ff., http://www.biogasafrica.org/index.php?option=com_docman&Itemid=16&lang=en, last accessed 18.02.2011

[20]Ibid Biogas for Better Life (2007): Promoting Biogas Systems Kenya. A Feasibility Study (2007), p. 4ff., http://www.biogasafrica.org/index.php?option=com_docman&Itemid=16&lang=en, last accessed 18.02.2011

[21] GTZ (2009): Analysis of the Market Potential for Domestic Biogas in Rural Kenya, p. 7. (Document provided to DOE)

Sub-step 4b: Discuss any similar Options that are occurring

It has been demonstrated above that similar activities, though existent, are not widely observed and commonly practiced.

Therefore, it can be concluded that the project activity is additional, as, according to the tool, *"if Sub-steps 4a and 4b are satisfied, i.e.(i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional"*.

CDM Consideration

In line with EB 41, Annex 46 (valid at time of submitting the prior consideration form) and EB 62, Annex 13 (valid at time of requesting registration), prior Consideration Form was sent to the UNFCCC and DNA on September 10, 2010, within 6 months of the start date of the project activity.

List of events:

Event	Date
Start date of project activity	1 June 2010
Pilot phase with baseline survey, training of masons and construction of pilot units	June 2010 to November 2010
Local Stakeholder Consultation	August 2010
Prior Consideration Form submitted to UNFCCC and DNA	September 2010
Letter of no-objection of Kenyan DNA (NEMA)	December 2010
PDD submission to DOE for validation	April 2011
GSP webhosting UNFCCC website	05 May 11 - 03 Jun 11

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The step-wise approach of the methodology applied, including methodological choices (where applicable) and equations to be used for calculation of emission reductions will be demonstrated in this section.

The following description refers to a single 2 m^3 (gas storage) biogas unit. Larger units will also apply the same emission reductions per unit. For clarity reasons, project emission and leakage consideration are also included in this section.

Emission reductions are calculated by multiplying the number of biogas units operating with the emission reductions per unit.

As demonstrated above in Section B.4., besides fuelwood and charcoal use also Kerosene and LPG are used in the project area. The use of the fossil fuels is part of the baseline, but not for calculation of emission reductions. This is deemed conservative because inclusion of fossil fuels in the project would have led to higher emission reductions.

Furthermore, emission reductions further come from anaerobic storage of dung, which will be reduced when users are feeding their biogas units with dung on a daily basis. Again, for the sake of conservativeness, these emission reductions are not considered.
It remains:

AMS I.E. (Version 04) : Switch from Non-Renewable Biomass for Thermal Applications by the User

Step	Description	Derived Parameter(s)	Data source(s)
I.E.-1	Determination of quantity of woody biomass substituted or displaced (per unit) (including potential leakage)	B_y (gross per unit)	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.)
I.E.-2	Determination of the share of Non-Renewable woody biomass	$f_{NRB,y}$	Own assessment based on FAO data (FRA 2010)
I.E.-3	Determination of the fossil fuel likely to be used by similar consumers	$EF_{projected\_fossilfuel}$	AMS I.E. Default value
I.E.-4	Determination of Leakage	LE_{NRB}	AMS I.E. Default value
I.E.-5	Calculation of Emission Reductions	$ER_{nrb,y}$	

Step I.E.-1: Determination of quantity of woody biomass that is substituted or displaced

According to AMS I.E., v. 4, par. 6, B_y can be 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 can be derived from historical data or estimated using survey methods.
Historical data is available on national level. This is external official historical data and is used for the determination of B_y. Only for comparison of data, results from a baseline survey from atmosfair/ BTA Consultants is also presented here. Since the values from the baseline survey are not used for determining parameter values and finally emission reductions, it is not necessary to include a sampling plan here. Please note that there is a sampling plan for the monitored parameters which are determined by sampling in Section B.7.2. The full baseline survey report was submitted to the DOE.

Household firewood consumption in rural areas among firewood users is reported as 3,394 kg/ and 89 % of rural households use firewood (Kamfor report 2002, p. 10).
Therefore, the average fuelwood consumption which is substituted by a biogas unit is 3,394 kg/a * 0.89 = 3,020 kg/a.
Household charcoal consumption in rural areas among charcoal users is reported as 717 kg/a.

(Kamfor report 2002, p. 12). The average charcoal consumption was multiplied with IPCC Factor of 6[22] to convert it into woodfuel consumption. The average amount of woodfuel consumption for charcoal of those households using charcoal was calculated to be 4,302 kg per household and year.

According to the official Kamfor report, 34% of rural households use charcoal. Therefore, the average woodfuel consumption for charcoal which is substituted by a biogas unit is 4,302 kg/a * 0.34 = 1,462 kg/a.

The average annual quantity of woody biomass substituted by a biogas unit is hence 3,020 kg/a + 1,462 kg/a.

B_y (gross per unit)
4.482 t/a

Note: This is the gross quantity without consideration of Net-to-gross adjustment factor for leakage (see Step I.E.-4 below). The value used for calculation of emission reductions is hence further reduced by 5%.

Discussion and Conclusion
The Kamfor report is official data published by the Kenyan Ministry of Energy. Comparing the data to the results from atmosfair/BTA survey in the project area shows that the values are in the same range.
The Baseline Survey found that households are using 3,321 kg/a of fuelwood on average. In the baseline survey, $84.\overline{33}\%$ of all surveyed households are using fuelwood.
The Baseline Survey found that households are using 573 kg/a of charcoal on average. In the baseline survey, $78.\overline{33}\%$ of all surveyed households are using charcoal.
The higher share of charcoal users in the baseline survey compared to the Kamfor report can be explained by the proximity to Nairobi and hence existence of a charcoal distribution network. The use of the results from Kamfor is more conservative, since, despite a higher household consumption, the consumption is multiplied with a lower share of users (34% compared to 78%).

Step I.E.-2: Determination of the share of Non-Renewable biomass

The following quotes illustrate the extend of deforestation and how firewood contributes to it:

"Most of the natural forests are currently facing a lot of threat from human activity that include illegal encroachment, excisions, charcoal burning, poaching of timber and other forest products and forest fires originating from adjacent farmlands. If this trend persists it is expected that the total area under national forest will decline substantially to give way to agricultural activities. Over-exploitation and lack of proper

[22] IPCC (1996): „Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual", Chapter Energy, p. 1.45, http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf, last accessed 17.02.2011. Though local data is available (Ministry of Energy "STUDY ON KENYA'S ENERGY DEMAND, SUPPLY AND POLICY STRATEGY FOR HOUSEHOLDS, SMALL SCALE INDUSTRIES AND SERVICE ESTABLISHMENTS (Kamfor 2002) states "More than 90% of charcoal in Kenya is produced in earth kilns, which are characterized by very low conversion efficiencies in the ranges of 10–15% by weight.") the IPCC factor was used in order to be conservative.

management is also rampant in most of the forests falling under the local authorities in trust lands, some of which are faced with threat of extinction" [23]

The imbalance between demand and supply of firewood and charcoal "has led to widespread deforestation, de-vegetation and land degradation. Post-election [violence] adversely affected the already marginal forest cover of less than 2 per cent, allowing encroachment on forest estates and land." [24]

According to AMS I.E., v. 4, par. 7, Project participants shall determine the shares of renewable and non-renewable woody biomass in B_y (the quantity of woody biomass used in the absence of the project activity) using nationally approved methods (e.g. surveys or government data if available) and then determine $f_{NRB\,y}$.

To calculate NRB, the following equation shall be used (par.8):

$$f_{NRB,y} = \frac{NRB}{NRB + DRB}$$

Where:

$f_{NRB,y}$	=	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass (calculated)
NRB	=	Quantity of Non Renewable Biomass
DRB	=	Quantity of Demonstrably Renewable Biomass

A) Assessment of Non-renewable woody biomass in the project area

According to AMS I.E., v. 4, par.7, Non-renewable woody biomass (NRB) is the quantity of woody biomass used in the absence of the project activity (B_y) minus the DRB component, as long as at least two supporting indicators are shown to exist:

- Trend showing increase in time spent or distance travelled by users (or fuel-wood suppliers) for gathering fuel wood or alternatively trend showing an increase in the distances the fuel wood is transported to the project area

The Baseline survey showed that currently the households which are collecting firewood are spending in average more than 1 hour per day collecting fuelwood. There is an increasing trend in time taken to collect fuel wood as can be seen from the table below:

Trend in time taken to collect fuel wood in recent years (N= 214)[25]

[23] UNEP (2011): Nairobi river Basin Programme, Environmental Profile of Kenya, Deforestation. http://www.unep.org/roa/Nairobi_River_Basin/About_Nairobi_River_basin/profiles/default.asp?case=Deforestation, last accessed 11.02.2011

[24] UNDP: Programme Document for Kenya (2009-2013), http://www.undp.org/africa/programmedocs/KENYA-CPD-2009-2013.pdf, last accessed 17.02.2011

Increasing	165 (77%)
Stable	26 (12%)
Decreasing	23 (11%)

Table 7: Time trends of fuelwood procurement

- Increasing trends in fuel wood price indicating scarcity

In the Baseline Survey, nearly every respondent confirmed that the fuel wood prices went up in the recent years, as can be seen from the table below:

Fuel wood price trend in recent years (N = 253)	
Increasing	251 (99%)
Stable	1 (0%)
Decreasing	1 (0%)

Table 8: Price trends of fuelwood procurement

Conclusion:
As can be seen from the baseline survey results, there is a great demand and consumption of biomass to serve the daily energy needs for cooking. Fuelwood is either bought or collected by the households themselves. It is mainly extracted from local forest resources, which can be seen from the time spent for collecting fuelwood. Charcoal is usually bought in small quantities like 1.5 to 2 kg tins. It is produced and provided by charcoal producers from whole Kiambu District and surrounding districts. There is consequently a huge pressure on local woody biomass resources due to the domestic consumption of biomass. This picture is being confirmed by government data which show the rates of deforestation and the exploitation of Kenyan forest resources (see below). Main drivers of deforestation and forest degradation are population growth, lack of access to energy substitutes and the conversion of indigenous forest and bush-land to agricultural land such as farmland and plantations.

Therefore, B_y minus the DRB component can be used to determine NRB.

B) Assessment of Demonstrably Renewable woody biomass in the project area

According to AMS I.E., v. 4, par.7, woody biomass is “renewable” if one of the following two conditions is satisfied:

I. The woody biomass is originating from land areas that are forests where:
   (a) The land area remains a forest; and
   (b) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
   (c) Any national or regional forestry and nature conservation regulations are complied with.

[25] Note: N refers to the total number of valid responses

II. The biomass is woody biomass and originates from non-forest areas (e.g., croplands, grasslands) where:
   (a) The land area remains as non-forest or is reverted to forest; and
   (b) Sustainable management practices are undertaken on these land areas to ensure in particular that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
   (c) Any national or regional forestry, agriculture and nature conservation regulations are complied with.

Data sources for assessment

There is a lack of data for Nairobi river Basin. Though Kenya Forestry Service is working on an inventory of gazetted forests, this inventory has not yet been published. Therefore, data on national level has been used for assessment. The most reliable data provides the FAO (Food and Agriculture Organization) Forest Resource Assessment (FRA) of 2010[26] as a standardized global data collection on forest resources.

I Forest areas

Kenya has 3.467 million ha of forest cover which is equivalent to 5.9% of the total land area. Forest is defined as land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. The forest cover consists of indigenous forest resources, industrial plantations under the management of KFS (Kenya Forestry Service) and private industrial plantations and fuel wood plantations, mainly serving the tea industry.

As can be seen from the table below, forest area has decreased by 6.4% in the last 20 years, leading to a decrease in carbon stocks. Only private plantations have increased but are still only a minor share of all forest areas.

Category of forest resource (using FAO definitions)	**Average vol. of growing stock**	**Area ('000 ha)**				**Total growing stock ('000 m³)**				**Change 1990 to 2010 (in %)**
	m³/ha	**1990**	**2000**	**2005**	**2010**	**1990**	**2000**	**2005**	**2010**	
Indigenous closed Canopy	174	1,240	1,190	1,165	1,140	215,760	207,060	202,710	198,360	-8.1
Indigenous Mangroves	174	80	80	80	80	13,920	13,920	13,920	13,920	0
Open woodlands	174	2,150	2,100	2,075	2,050	374,100	365,400	361,050	356,700	-4.7
Public	302	170	134	119	107	51,340	40,468	35,938	32,314	-37.1

[26] Food and Agriculture Organization (2010): Global Forest Resources Assessment 2010. Country Report Kenya. http://www.fao.org/docrep/013/al543E/al543E.pdf, last accessed 17.02.2011

Plantation Forests										
Private Plantation forests	302	68	78	83	90	20,536	23,556	25,066	27,180	+32.4
Sub-total (Forests)		**3,708**	**3,582**	**3,522**	**3,467**	**675,656**	**650,404**	**638,684**	**628,474**	

Table 9: Change of forest resources between 1990 and 2010 (Source: FAO 2010, p. 8 and p. 24f.)

II Non-forest areas

Additional Kenya has 28.650 million ha of "Other wooded land" which is equivalent to about 49.3% of the land area and defined as land not classified as forest, spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.

As can be seen from the table below, the area of "other wooded land" has decreased by 1.5% in the last 20 years, leading to a decrease in carbon stocks.

Category of forest resource (using FAO definitions)	Average vol. of growing stock	Area ('000 ha)				Total growing stock ('000 m³)				Change 1990 to 2010 (in %)
	m³/ha	1990	2000	2005	2010	1990	2000	2005	2010	
Bush-land	16	24,800	24,635	24,570	24,510	396,800	394,160	393,120	392,160	-1.1
Grasslands (40%)	16	4,292	4,194	4,140	4,140	68,672	67,104	66,240	66,240	-3.5
Sub-total (Other wooded land)		**29,092**	**28,829**	**28,710**	**28,650**	**465,472**	**461,264**	**459,360**	**458,400**	

Table 10: Forest types in Kenya (Source: FAO 2010, p. 8 and p. 24f.)

Assessment according to criteria of AMS I.E., par. 7:

Category of forest resource (using FAO definitions)	Criteria a fulfilled	Criteria b fulfilled	Criteria c fulfilled	Conclusion NRB/DRB If all of the criteria are fulfilled, then category is classified as DRB
Indigenous closed Canopy	☑	☒	No info	NRB
Indigenous Mangroves	☑	☑	No info	DRB
Open woodlands	☑	☒	No info	NRB
Public Plantation Forests	☑	☒	No info	NRB
Private Plantation forests	☑	☑	No info	DRB

Bush-land	☑	☒	No info	NRB
Grasslands (40%)	☑	☒	No info	NRB

Note: Criteria a was seen as fulfilled since the category of forest or other wooded land is still there in the 2010 figures of the FRA and there are still areas classified under this categories in 2010. Criteria b was assessed according to whether growing stock is stable or increasing (criteria fulfilled) or decreasing (criteria not fulfilled). As for criteria c, since no information was available to the PPs, criteria was counted as fulfilled for conservativeness reasons in the overall assessment.

Quantity of renewable and non-renewable biomass

In line with the definition of AMS I.E., ver. 4, par. 7, only areas where all three criteria as mentioned in par. 7 are fulfilled qualify as renewable. Since at least the criteria “no decrease of carbon stocks” is not fulfilled in areas where there is a decrease in the area, as explained above, only the private plantation forests and the indigenous mangrove areas can be considered as a renewable source.

Therefore, using most recent data for growing stock (2010), the equation as per par. 8 of the AMS I.E., ver. 4, is as follows:

$$f_{NRB,y} = \frac{NRB}{NRB + DRB}$$

$$f_{NRB,y} = \frac{1{,}045{,}774{,}000m^3}{1{,}045{,}774{,}000m^3 + (27{,}180{,}000m^3 + 13{,}920{,}000m^3)} = 0.962$$

Step I.E.-3: Determination of fossil fuel likely to be used by similar consumers

According to AMS I.E., v. 4, par. 5, the emission factor for substitution of non renewable woody biomass by similar consumers must be taken to determine emission reductions from non-renewable biomass.

The default value to be used and as provided by the methodology is 81.6 t CO_2/TJ.

Step I.E.-4: Determination of Leakage

According to AMS I.E., v. 4, par. 10 and 11, the following leakage sources have to be considered:

Leakage Source	Included?	Justification/ Explanation
Use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources.	Yes	In line with the methodology, B_y is multiplied by a net to gross adjustment factor LE_{NRB} of 0.95 to account for leakages.
If the equipment currently being utilised is transferred from outside the boundary to the project boundary, leakage is to be considered	No	The biogas units will be newly built units, therefore it is not necessary to consider this leakage source.

Step I.E.-5: Calculation of emission reductions from substitution of non-renewable biomass (per unit)

For substitution of non-renewable woody biomass with biogas, emission reductions are calculated as follows:

Emission reductions from the use of non-renewable biomass (per unit)				
$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$				
Activity Data	**Value**	**Unit**	**Parameter**	**Source**
Quantity of Biomass that is substituted or displaced (incl. NTG Leakage Adjustment Factor)	4.257	tonnes/yr/household	B_y *(net per unit)*	Kamfor report
Fraction of non-renewable Biomass	0.962		$f_{NRB,y}$	Own assessment based on FAO Data
Net calorific value of the non-renewable biomass	0.015	TJ/tonne	$NCV_{biomass}$	AMS I.E.
Emission factor projected fossil fuel (AMS I.E.)	81.6	tCO2/TJ	$EF_{projected\_fossilfuel}$	AMS I.E.
Emission reductions from the use of n-r biomass	**5.012**	tCO2/yr/unit	ER_y *(unit)*	Calculated

Table 11: Emission reductions from the substitution of non-renewable biomass per unit

B.6.2. Data and parameters that are available at validation:

AMS I.E.:

Data / Parameter:	B_y (net per unit)
Data unit:	tonnes/year/household
Description:	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tonnes
Source of data used:	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 applied:	4.257
Justification of the choice of data or description of measurement methods and procedures actually applied :	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: $B_y(netperunit) = B_y(grossperunit) \bullet LE_{NRB}$
Any comment:	This is a fixed value throughout the crediting period.

Data / Parameter:	$f_{NRB,y}$
Data 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 used:	FAO (Forest Resource Assessment 2010)
Value applied:	0.962
Justification of the choice of data or description of measurement methods and procedures actually applied :	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.
Any comment:	This is a fixed value throughout the crediting period.

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/tonne
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data used:	AMS I.E., ver. 4
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is a default value as per AMS I.E., ver. 4, par. 5.
Any comment:	This is a fixed value throughout the crediting period.

Data / Parameter:	$EF_{projected\_fossilfuel}$
Data unit:	tCO2/TJ
Description:	Emission factor for substitution of non renewable woody biomass by similar consumers.
Source of data used:	AMS I.E., ver. 4 (default value)
Value applied:	81.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is a default value as per AMS I.E., ver. 4, par. 5.
Any comment:	This is a fixed value throughout the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

For the steps to arrive at the parameters required to calculate emission reductions for displacement of non-renewable biomass please refer to Section B.6.1

Emission reductions are calculated as follows:

$$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$$

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

Therefore:

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

Where:

ER_y	=	Emission reductions during the year *y* in tCO_2e
N_y	=	Adjusted total number of biogas units deployed until year y of end users who confirmed that non-renewable biomass was displaced/substituted
DO_y	=	Statistically adjusted drop out from total population of units in period y
B_y (net per unit)	=	Quantity of fuelwood and woodfuel consumption for charcoal that is substituted or displaced in tonnes (tonnes/year/household)
$f_{NRB,y}$	=	Fraction of non renewable woody biomass used in the absence of the project activity in year y (dimensionless)
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (TJ/tonne)
$EF_{projected\_fossilfuel}$	=	Emission factor for substitution of non renewable woody biomass by similar consumers (tCO2/TJ)

Notes:

1. AMS I.E., ver. 4 offers two options for determining B_y. PPs choose 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: $N_y \bullet B_y(netperunit)$

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 10 a of AMS I.E., ver.4) is addressed by the net to gross adjustment factor of 0.95. Therefore,
$B_y(netperunit) = B_y(grossperunit) \bullet LE_{NRB}$

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)

01/07/2012-31/12/2012	0	310	0	310
2013	0	6,754	0	6,754
2014	0	18,840	0	18,840
2015	0	33,082	0	33,082
2016	0	47,619	0	47,619
2017	0	47,118	0	47,118
2018	0	46,616	0	46,616
2019	0	46,115	0	46,115
2020	0	45,614	0	45,614
2021	0	45,113	0	45,113
01/01/2022-30/06/2022	0	22,305	0	22,305
Total (tonnes of CO2 e)	**0**	359,486	**0**	359,486

Total number of crediting years: 10
Annual average of the estimated reductions over the crediting period: 35,949 tCO_2 e

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Monitoring number of biogas units deployed

Data / Parameter:	N_y
Data 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
Source of data to be used:	End user agreements. In the end user agreement end users also confirm to substitute/displace non-renewable biomass. This will also be checked during monitoring for parameter DOy (see below).
Value of data	See Section A 2. for ex-ante estimation
Description of measurement methods and procedures to be applied:	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. $$N_y = \sum_{i=1}^{y} n_i \cdot OT_{adjusted,i,y}$$ **Parameter**: n_i — **Description**: Number of units commissioned in period i as documented by end user agreements and reported in an electronic database

$OT_{adjust,i,y} = \begin{cases} 1 & ,i < y \\ \frac{d_{average,y}}{mp_{length}} & ,i = y \end{cases}$	Adjustment factor for reduced operational time of units deployed in period y
$d_{average,y}$	Average number of days that units 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 to be applied:	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.
Any comment:	

Monitoring operations of biogas units

Data / Parameter:	DO_y
Data unit:	%
Description:	Statistically adjusted drop out from total population of units in period y
Source of data to be used:	Primary data collection: dedicated monitoring team
Value of data	1% * y (y = year)
Description of measurement methods and procedures to be applied:	Monitoring of the statistically adjusted drop out involves two steps: Step 1: Sample survey amongst units deployed as specified in section B.7.2 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. 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. 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. 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.
QA/QC procedures to be applied:	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. A traceable "identity check" of the units visited during sampling shall be performed and recorded (e.g. a picture of the biogas unit).
Any comment:	

B.7.2 Description of the monitoring plan:

The general set-up of the monitoring is as follows:

Roles and responsibilities for monitoring by SES

Person	Role
Monitoring Head	The Monitoring Head will be responsible for administering the electronic data storage, and data review
Monitoring team	The monitoring team will conduct the surveys.

Training
SES will provide training or second trainers to persons involved in the monitoring to ensure accuracy and completeness of data recorded. This training procedures will be described in an internal Monitoring Manual.

Monitoring report to be provided to Verification Entity:
SES Monitoring head and atmosfair will be responsible for preparing the Monitoring Report with the support of the monitoring team.

Data archiving
Data will be stored for the crediting period and an additional two years.

The monitoring requirements of the applicable methodology are as follows:

Monitoring Requirements AMS I.E., ver. 4	Applicable to project activity?	Justification/ Explanation
Para 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.	Yes	This requirement is applicable to all project activities using the methodology.
Para 13: In order to assess the leakages specified under	No	By is multiplied with a Net

paragraph 10, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources). Other data on non-renewable woody biomass use required for leakage assessment shall also be collected.		to Gross Adjustment Factor of 0.95 as per para 10 of AMS I.E., ver. 4, in which case surveys are not required.
Para 14, Phrase 1: Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location.	Yes	This requirement is applicable to all project activities using the methodology.
Para 14, Phrase 2: In the case of appliances switching to renewable biomass the quantity of renewable biomass used shall be monitored.	No	Project activity is not switching to renewable biomass, but to biogas.
Para 15: In case option (b) in paragraph 6 is chosen for baseline calculations, monitoring shall include the amount of thermal energy generated by the new renewable energy technology in the project in year y, where applicable.	No	Option (b) of para 6 is not chosen for baseline calculations
Para 16: In the case of renewable energy based water treatment technologies, water quality shall be monitored to ensure that it conforms to drinking water quality specified in relevant national microbiological water quality guidelines/standards of the host country. In case a national standard/guideline is not available, the standards/guidelines by the World Health Organization (WHO) or United States Environmental Protection Agency (US-EPA) shall be applied.	No	Project activity does not involve water treatment technologies

Monitoring will be carried out according to the methods and procedures (incl. QA/QC procedures where applicable) specified in the monitoring tables under Section B.7.1., in each Monitoring period.

Where a parameter is determined via survey, sampling will be in accordance with the Standard for sampling and surveys for CDM project activities and programme of activities (EB65, Annex 2).
Random sampling will be applied. Documentation of the sampling will be provided i.a. in the Monitoring Report. All data will be stored for the crediting period and an additional two years. Therefore, providing traceability of the selection.

The sampling plan is as follows:

Sampling Plan

The Sampling Plan is using the outline as proposed in Appendix 3 of the standard for sampling and surveys for CDM project activities and programme of activities (EB65 Annex 2).

1. **Sampling Design**

    a. Objective and Reliability Requirements

i. Objective of the sampling effort

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.

Therefore data for the following parameter will be compiled as a result of conducting the survey:
DO_y,

ii. Timeframe

The time frame for the parameter, i.e. annual or biennial, depends on selected inspection frequency which is at discretion of Project Participants provided confidence/precision requirements are met, according to AMS-I.E., para 12 and 17. It is therefore not mandatory to determine ex-ante the inspection frequency, i.e. annual or biennial.

iii. Estimated parameter values

The estimated parameter values are as per the values used for ex-ante calculation of emission reductions (please refer to Section B.7.1).

As an example, the values for the first monitoring period are estimated as follows:

Data / Parameter:	***DO_y***
Data unit:	%
Description:	Statistically adjusted drop out from total population of units in period y
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1% (p.a.)
Justification	Technology design is from AFPRO as explained above. Lifetime is over 15 years. In India, several ten thousands of units were constructed and are in good conditions even after many years of usage.

iv. Sampling requirements as per sampling standard and applicable methodology

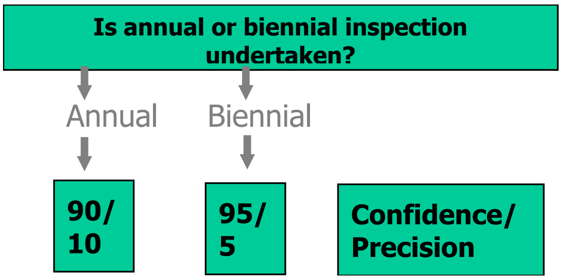
Precedence of methodology
Para 4 of the Sampling Standard, EB 65, Annex 2 clarifies that *"[...] any requirements specified in the applicable methodologies having precedence"*.

Coverage of sampling requirements in the applicable methodology:
As per applicable methodology AMS-I.E. para 17: *"When biennial inspection is chosen a 95% confidence interval and a 5% margin of error requirement shall be achieved for the sampling parameter. On the other hand 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.".

v. Confidence/precision criteria to be met

As mentioned above, according to AMS-I.E., ver.4, para 17, confidence/precision criteria to be met is determined as follows:



Note: As per para 17 of AMS-I.E., ver.4., the lower bound can also be used instead of repeating the survey efforts to achieve the required confidence/precision level

b. Target Population

i. Definition

All biogas units which are deployed up to the specific monitoring

ii. Description of particular features associated with it (if applicable)

There are no particular features associated with the target population.

c. Sampling method

i. Description and justification of selected sampling method

The sampling procedure may consist of a single-stage process which randomly samples biogas units.
Since the precision of a sampled parameter depends on the variation of its values, the necessary number of units to be monitored in order to achieve the confidence/precision as mentioned above will also depend on the variation of values.

Random distribution
The method of selecting units to be included in the sample for deployed units will be random. All random selections will be stored for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. Therefore, providing traceability of the selection.

ii. Identification of strata or clusters if applicable

Not applicable, only simple random sampling (one stage) will be applied.

d. Sample size: Estimated target number of units and justification

The following assumptions are applied to calculate the sample size for the different sampling options. Please note: The assumptions are valid at time of submitting the PDD for registration. If at the time of sampling more up to date figures or information is available (e.g. from previous monitoring campaigns or from other projects applying the same technology) which can be applied to do a more accurate sampling these will be used to determine the sample size and justification will be provided to the verifying DOE.

Parameter of interest	Expected value	Source for expected value	Estimated variance	Source for estimated variance
DO_y	1% (p.a.)	The biogas units have a lifetime of at least 15 years and due to the high end user contribution to the investment costs, the maintenance service offered by SES and also the close monitoring required under the CDM we do not expect a high number of drop-outs, therefore, a drop-out rate of 1% (p.a.) was assumed. Therefore, the operational rate is expected to be 99% in year 1, 98% in year 2, and so on.	Not applicable since the parameter is a proportion	Not applicable

Sample Size for different sampling options, according to formula provided in EB 67 Annex 6 (best practice examples focusing on sample size and reliability calculations)

Sampling method	Simple Random Sampling	
Reliability requirement	Annual Sampling (90/10)	Biennial Sampling (95/5)
Sample size to determine operational rate (n)	4	20

Note: Response rate is assumed to be 80%. For subsequent monitoring periods, the value determined in last monitoring period will be used for calculation of sample sizes.

Note: Since these sample sizes are relatively small, PPs commit to a minimum sample size of 30 units.

e. Sampling Frame

i. Identification or description of sampling frame

The sampling frame is the list containing all biogas units which are deployed up to the specific monitoring period.

ii. List of sampling frame (if known)

The full list of all biogas units deployed will only be available after the end of the specific monitoring period. At time of submitting the PDD for registration there is no complete list available since full roll-out of biogas unit deployment will only happen after CDM registration.

Example of the sampling frame:

ENDUSER AGREEMENT DATE	NAME OF USER	USER DATA					GPS (decimal format)	
DD/MM/YYYY	Full name and first name	Villa	Locati	Divisi	Cour	PHONE NUMB	Latitu	Longitu
10.09.2011	Nancy B. Wangui Miringu	Nginduri	Komothai	Komothai	Kiambu	0722272617	S1.069180	E36.864531
23.09.2011	Anne W. Kamau	Mihuko	Komothai	Komothai	Kiambu	0726442759	S1.056111	E36.843853
23.09.2011	Elizabeth Wangui	Mbari-ya-igi	Komothai	Komothai	Kiambu	0715667227	S1.069633	E36.863113

2. Data to be collected

a. Field Measurement

i. Identification of all variables to be measured

The following variables are measured for determining the parameter values of:

Parameter	Description of variable which is measured
DO_y	Statistically adjusted drop out from total population of units in period y (by determining the number of operational units)

ii. Determination of appropriate timing

In general (under normal circumstances), measurements will be conducted at last 6 months after the end of the specific monitoring period.
Therefore:
In general (under normal circumstances), the measurement will be conducted at last 12 + 6 months after the start of the specific monitoring period (annual monitoring) or at least 24 + 6 months after the start of the specific monitoring period if biennial inspection is chosen.

iii. Frequency of measurements

All measurements will be one time measurements, i.e. for the determined number of samples the measurement will only be conducted once per sample. However, this does not imply that every household can only be contacted once (see below).

iv. Demonstration that parameter of interest is not subject to seasonal fluctuations if measurements are conducted only during limited time periods or demonstrate that selected time period is conservative or corrections are applied

DO_y: Drop outs are recorded when biogas units are found not to be operational during the specific monitoring period. It is expected that the chance a unit is no longer in use is increasing over time for various reasons however seasonal effects will have no impact on the general operating conditions.

v. Description of measurement methods

DO_y
Drop outs will be determined through interviews/checks where it will be checked if the units are still operational. Interviews will be reported in a questionnaire.

b. Quality Assurance/ Quality Control

i. Procedures for conducting the data collection and/or field measurements

Data collected and processed by the monitoring team will be checked regularly by the monitoring head.

Training of field personnel
All personnel involved in the monitoring will be trained to ensure that each of them undertakes an appropriate monitoring assignment according to the Monitoring Plan. Any personal involved in the monitoring will be trained by SES or by or a person dedicated by atmosfair before performing any monitoring activities. Only people who are trained are qualified to be involved in the monitoring.

Provisions for maximizing response rates
Documentation of out-of-population cases, refusals, other sources of non-response

- Out of population cases

The sampling list can only consist of units which are in the population, i.e. biogas units that are deployed up to the specific monitoring period. However, in case households with biogas units which are not recorded in the sampling list, data from these households will be rejected by atmosfair and the respective household will not be counted towards fulfillment of the confidence/precision requirement.

- Refusals and non-respondents

Refusals and non-respondents (households where the contact could not be established and hence biogas units that could not be checked) will be recorded by the monitoring team as well as the reason for the refusal.
In case a household refuses to participate in the monitoring effort, the monitoring team will record the reason for the refusal and decide whether or not the refusal is due to a likely non-operation of the biogas unit. If atmosfair decides that the refusal is due to a likely non-operation of the biogas unit, this biogas unit will count as Drop-Out. If the reason is e.g. a time constraint which cannot be solved by repeating the survey effort at this household at another date, the household will be replaced by another household (see above, 20% estimate of non-response).

ii. Procedure for defining outliers and under what circumstances outlier data/measurements may be excluded and/or replaced

atmosfair will apply the "3 sigma rule": All values outside 3 standard deviations of the mean will be excluded.[27]
Other appropriate measures to define and exclude outliers may also be used.

c. Analysis: Describe how the data will be used

Data will be used to calculate emission reductions achieved during the specific monitoring period according to the equations provided in Section B.6.3 of the PDD. SES Monitoring head and atmosfair are responsible for preparing the Monitoring Report with the support of the monitoring team.

3. Implementation Plan

a. Schedule for implementing the sampling effort

As mentioned above, the schedule for implementing the sampling effort shall be so that within 6 months after the end of the specific monitoring period the effort can be finalized.

b. Skills and resources required for data collection and the analyses, general description of qualifications and experience

SES and atmosfair will assign the people, entities or qualified third parties responsible for the data collection (the "monitoring team"). SES and atmosfair will ensure that the qualification and experience of the person or entity involved is adequate for the specific tasks to be performed by the person or entity.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

14/04/2011
Daniel Becker, Florian Zerzawy, atmosfair gGmbH
(Entity is also project participant and as such listed in Annex 1)
David Karanja, Sustainable Energy Strategies Ltd.
(Entity is also project participant and as such listed in Annex 1)

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/06/2010 (Date of first expenditures related to construction of biogas units)

[27] See for further information: http://en.wikipedia.org/wiki/68-95-99.7_rule, last accessed 21.02.2012

C.1.2. Expected operational lifetime of the project activity:

15 years
This is a conservative estimate. The technology designer from AFPRO state in their manual: "By building the biogas plant with qualitative materials a lifetime from 25 to 30 years can be expected"[28]

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

N/A

C.2.1.2. Length of the first crediting period:

N/A

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2012, or date of registration, whichever is later.
,

C.2.2.2. Length:

10 years, 0 months

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

As per prevailing law no EIA is required for this type of project activities, The ACT NO. 8 of 1999 - Environmental Management and Co-ordination Act [29] states under the second schedule the projects to undergo an Environmental Impact Assessment. Domestic biogas units are not mentioned in the list of projects, since an EIA is typically only necessary for large-scale industry projects, transportation, urban development etc). .

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[28] Manual on Deenbandhu Biogas Plant – 1987; p.6 (provided to DOE)

[29] http://www.kenyalaw.org/environment/content/legislation.php, checked 24/06/2011

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

N/A

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

A stakeholder consultation was conducted in order to collect stakeholder's comments and desires on the project design.

The invited stakeholders were identified and invited according to the guidance provided by the Gold Standard:

A) Representatives of dairy farmers in project area, which are impacted by the project. The dairy cooperatives forwarded the invitation to their members – local dairy farmers.
B) Local policy makers and representatives of local authorities.
C) An official representative of the DNA of the host country.
D) Organisations working in the fields of biogas, environmental protection and household energy in the project area.
E) Local Gold Standard representatives.
F) Non-governmental organisations supporting the Gold Standard.

The Local Stakeholder Consultation was held on 21st August 2010 in Kikuyu Hospital/Thogoto, Kiambu District. The agenda of the consultation was as followed:

Time	Agenda	Presented by
09.00 – 09.15	Opening of the meeting/Introduction	David Karanja, SES Daniel Becker, atmosfair
09.15 – 09.30	Explanation of the project	David Karanja, SES; Daniel Becker, atmosfair
09.30 – 10.00	Questions for clarification	All participants
10.00 – 10.30	Tea Break	
10.30 – 11.30	Blind sustainable development exercise and Discussion on monitoring sustainable development	All participants
11.30 – 12.00	Closure of the meeting	David Karanja, SES
12.00 – 14.00	On site visit to commissioned biogas units	All participants

Table 13: Agenda of stakeholder consultation

E.2. Summary of the comments received:

The minutes of the stakeholder consultation include all the comments and questions received from the stakeholders:

Prayers:
The meeting started with two hours delay at 11am with a word of prayers.

Welcoming remarks:
David Karanja of SES welcomed the stakeholders present and explained that the forum was for consultation and discussions to get the feedback from the stakeholders about the Nairobi River Basin Biogas project. He drew the attention of the stakeholders to the agenda of the meeting and called for their active participation.

Introduction:
After a short introduction of the project participants, the purpose of the meeting was explained as Consultation for Gold Standard, as well as the concepts of CDM and Gold Standard Registration with assistance from atmosfair. The stakeholders understood the importance of CDM registration and agreed that it would be wise to uptake it. The participation list was signed by all stakeholders.

Explanation of the project activity
David Karanja explained the main project activities: Goal of the project, project area, beneficiaries, construction and monitoring of units, training of masons and supervisors, advantages of biogas and requirements for households. Furthermore the stakeholders were updated on the progress of the pilot phase and further timelines were explained. During and after this session questions and comments arose which are summarized below:

Question for clarification:
Q: What added benefit will the biogas project using the Deenbandhu technology which is new bring to the market having in mind that there already exists other technologies in the market that have been tested over time and are working?
A: The Deenbandhu technology will be the cheapest biogas system introduced in Kenya. It is easy to construct and it uses locally available resources and manpower thus making it affordable to the average small scale zero grazing dairy farmers. The technology has been used in India for many years and has been financed through CDM on a number of occasions and has been shown to have a long life of up to 30 years. Its success rate is 98% as opposed to the prevailing technologies whose failure rate is well over 60%.
Q: In case that the farmers can’t afford the cash payment what other forms of financing are available to them or have you organized?
A: We are currently holding talks with financial institutions around e.g. Equity Bank to see how we can assist the local farmer to afford the cost of putting up the biogas unit. Also the registration for CDM Gold Standard will ease the cost of construction

Q: What are subsidies and who gets them after the Gold Standard registration and at what rate?
A: Subsidy is a misnomer because the correct situation is trading in carbon credits. The farmer will therefore have a commodity - carbon credits – to sell in the international carbon market thus having proceeds that will be a contribution to the cost of the biogas unit.

Q: What is meant by carbon credit?
A: Carbon credits are obtained by evaluating how much less greenhouses gases are being emitted after the construction of the biogas units. Evaluation is done against set standards by the United Nations.

Q: Will not the introduction of subsidy through selling of the carbon credits destabilize the existing market of biogas construction by other competitors?
A: The introduction of more market players will bring competition and thus reduce a monopolistic practice prevailing in the country as of now. With this, biogas technology will be affordable to the

consumers and in any case the introduction of CERs as a trading commodity is a source of income to the farmer and a motivation to maintaining the biogas unit.

Q: What exactly determines the amount of gas and is it possible to package the gas because there are cases when the gas produced is too much or is too little/ empty?
A: The amount of gas produced is determined by the amount of cow dung fed into the digester daily. The storage space in the digester is enough to store the amount of gas produced. In cases of excess gas it can be piped to other neighbours or can be used to run a generator to power irrigation pumps, chaff cutters or produce electricity but this can only be done using the large capacity biogas units.

Q: What is meant by monitoring and how do you plan to carry this out?
A: Monitoring will be done to ensure that the plants are working properly and that the end user is maintaining them as advised because the CDM Gold Standard requires that they run throughout. This will be done by trained supervisors and masons in case repairs and maintenance.

Q: Are there bigger capacities than 2 and 3m3 and can the smaller ones already constructed be converted to accommodate larger capacities of dung?
A: Yes there are larger ones but they are more costly. Feeding of the digester depends on its capacity and it can neither be under or over fed so as maintain them in a working condition. The conversion of small biogas units to big ones is not possible.
Comment from Stakeholder: It's good to inform the farmers on the available capacities so that they can decide on choice that suites them.

Q: If one doesn't have enough cow dung to fill the digester can the available dung be mixed with waste from other livestock e.g. pigs?
A: There is an analysis in the pipeline to see if that can be done.

Q: Other than gas, what other benefits does a biogas unit have?
A: The slurry that is produced is an organic fertilizer and it can be used to produce high value vegetables under organic farming. It can also be packaged and sold out to other farmers who do not have it but require it. The project also creates indirect job opportunities through sales. In the long term there will be a measurable conservation to the environment through reduced CO2 emissions and deforestation.
Comment from Stakeholder: Introduction of project is beneficial to small scale farmers as it reduces the cost of living and saves the environment. Good initiative.

Q: Do you plan to partner with other shareholders in the market like the Association of Biogas Constructers Kenya (ABCK) for the training of masons and supervisors and how many will be trained?
A: Maybe in future but for starters we will train them ourselves considering that this is a new technology and that statistics show that there has been 60% failure of other biogas projects in Kenya. So far we've trained 13 masons and 2 supervisors but we plan to add up the number as the project proceeds.

Q: How is sensitization being done to reach a larger population of small scale farmers and to educate them about the same?
A: During the baseline survey, the enumerators carried out the sensitization and creation of awareness. Furthermore awareness creation is always a part of the project activity. This consultation serves also as a multiplier for interested farmers.

Sustainable Development Assessment and Discussion on Monitoring Sustainable Development

The blind sustainable exercise was explained to the stakeholders of the required assessment of the project prior to registration as a CDM Gold Standard initiative by atmosfair with assistance of SES. The sustainable indicators were reviewed and it was discussed on their impact and how they could be monitored in a practical and cost-effective way.

Closure of the meeting
David Karanja thanked everybody for their participation and explained shortly the follow up of the project activity. The stakeholders gave their feedback on the consultation meeting held by filling out the evaluation form. Having no any other business the meeting ended at 1.30pm with a word of prayer.

E.3. Report on how due account was taken of any comments received:

Stakeholders that were invited to the meeting who could not attend but wished to receive information were sent the minutes and the PowerPoint Presentation of the meeting and were asked to give comments if desired. In the following table all comments received by the stakeholders are again summarized and explained how the comment was taken into account for the project design:

Stakeholder comment	Was comment taken into account?	Explanation
Concerns about new biogas technology in Kenya	No	Cheapest biogas system with durable and approved quality. Testing period serves to identify and mitigate implementation problems. Already existing CDM projects with this technology.
Alternative financing possibilities	Yes	Currently talks with Equity Bank on micro credit financing.
Destabilisation of the existing market of biogas through CDM subsidies	Yes	Different approach: CDM revenues will mainly be used for incentivise proper operations, rather than directly subsidising construction costs. Introduction of the CDM project will also raise competition among biogas suppliers. The biogas project is currently limited on Kiambu District and does not have a national scope.
Inform farmers on the available capacities of digesters	Yes	Is already done. The size of the plant will be decided with the household, depending on cow dung and water availability as well as their needs and desires
Plan to partner with other shareholders in the market like ABCK	Yes	For future this will be considered as a good opportunity. But in the pilot phase the masons and supervisors will be trained by AFPRO/ own staff as Deenbandhu model is a new technology in Kenya.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sustainable Energy Strategies Ltd.
Street/P.O.Box:	P.O Box 53601 – 00200, Nairobi
City:	Nairobi
State/Region:	Nairobi
Country:	Kenya
Telephone:	+254 20 600 40 73, 254 20 208 1997
FAX:	
E-Mail:	ses@jambo.co.ke
URL:	
Represented by:	Karanja, David
Title:	CEO
Last Name:	Karanja
First Name:	David
Mobile:	+254 720 940 227

Organization:	atmosfair gGmbH
Street/P.O.Box:	Zossener Straße 55
Building:	Aufgang D, 6. OG
City:	Berlin
State/Region:	Berlin
Postfix/ZIP:	10961
Country:	Germany
Telephone:	+49 30 627 3550-0
FAX:	+49 30 627 3550-29
E-Mail:	info@atmosfair.de
URL:	http://www.atmosfair.org
Represented by:	Zerzawy, Florian
Title:	CDM Project Developer
Last Name:	Zerzawy
First Name:	Florian
Direct FAX:	+49 30 627 3550-29
Direct tel:	+49 30 6273550-21
Personal E-Mail:	zerzawy@atmosfair.de

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The German Ministry of Environment, under its CDM-JI Initiative, supported the establishment of the PDD documentation. In addition, the German Ministry provided funding for the establishment of the baseline survey, training of masons and construction of biogas units during the pilot phase (June 2010 to November 2010).

Official Development Assistance is not being diverted to the implementation of this project activity as the funding was not provided on condition of Germany purchasing the credits from this project.

After the end of the pilot phase in November 2010, there was no other public funding of the project activity. All subsidies for the project are stemming from CDM revenues.

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION