PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	IMPROVED JIKOS – BETTER LIVING FOR RURAL POPULATION (GS 2457)
Version number of the PDD	Version 3.2
Completion date of the PDD	04/09/2015
Project participant(s)	Fastenopfer
Host Party(ies)	Kenya
Sectoral scope and selected methodology(ies)	Sectoral Scope: Energy Demand Type: End-use Energy Efficiency Improvement Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011
Estimated amount of annual average GHG emission reductions	43,103t CO2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>The project is the construction of efficient cook stoves to replace inefficient 3-stone fires in rural communities in Nyeri, Kitui, Machakos and Laikipia Counties, Kenya. This measure results in savings of unsustainably harvested firewood thereby reducing GHG emissions from thermal energy consumption. The project is supervised by Fastenopfer, a charitable foundation in accordance with Swiss law, and implemented by local partner organisations (see charter below in section A.1).

During the first crediting period of seven years the project plans to install approximately 41,100efficient cook stoves. This results in total GHG emission reductions of around 301,724t CO_2 equivalent. The average annual emission reduction amounts to 43,103t CO_2 equivalent.

This project is implemented in the following context:
The large majority of households in the project areas cook on open 3-stone fire, a common situation in a country where biomass provides over 68% of all energy requirements.[1]The National Environment Management Authority estimates that the Kenyan demand for biomass stands at 40.5 million tonnes against a sustainable supply of 16 million tonnes.[2] Looking at rural areas, fuel wood covers 80% of cooking energy needs.[3] Kitui for example reports that 90% of rural population use firewood for cooking purposes. Only 3.8% of households in Kitui are connected to electricity.[4] The consequence on deforestation is especially heavy in a country where only 2% of the landmass is covered by forests.[5] What is more, high wood fuel consumption due to open fires leads to heavy work load especially for women and children and an alarming number of people with respiratory diseases are observed. In order to tackle these issues the Kenyan Ministry for Energy proposes in its National Energy Policy 2012 the promotion of efficient and clean burning wood and charcoal stoves.

In the line of Kenya's National Energy Policy 2012, this project aims at mitigating the adverse effects of woodfuel use on health and environment by introducing energy efficient cookstoves. Further, beneficiaries of the new technology will bear fewer costs from buying/searching fuel wood. The project activity consists in the dissemination of a brick type rocket type energy efficient cookstove.

We consider three-stone cooking as baseline scenario of the present project. The baseline scenario is considered to be the same as the scenario prior to the implementation of the project.
Currently, a large majority of rural households in Kenya use the traditional three-stone fires for cooking purposes. A GiZ survey from 2006 reports that 87.5% of the population still uses traditional three-stone cooking.[6]The penetration of improved cookstoves in rural Kenya is estimated to be around 5%.[7]
However, rural communities in Kitui and Nyeri have not yet benefited from improved cookstoves. In the absence of the proposed project activities the potential beneficiaries would continue to use open 3-stone fire. Therefore, we consider the baseline scenario to be fixed over the whole crediting period.

The project contributes at several levels to a more sustainable development in the targeted areas. As mentioned above, the project reduces the pressure on forest land through reduced fuel wood need. This

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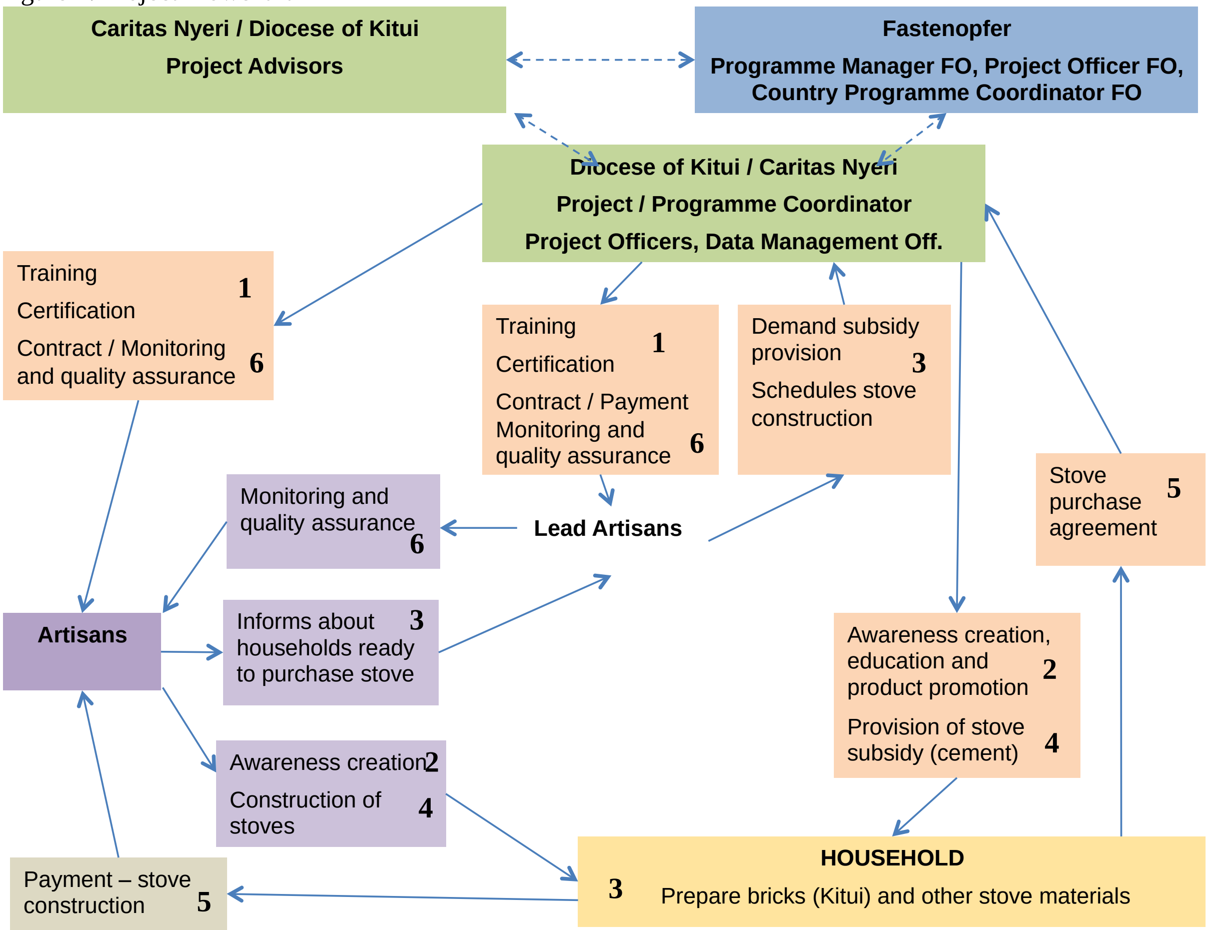
[1]Kenya National Energy Policy Draft 2014 p. 58.
[2]Muchiri. L. 2008. "Gender and Equity in Bioenergy Access and Delivery in Kenya." Study for the PISCES RPC. Practical Action Consulting East Africa.p. 8.
[3]National Environment Action Plan p. 36.
[4]Kitui District Environment Action Plan 2009-2013 p.69.
[5]National Environment Action Plan p. 25.
[6]Ingwe A (2007) Rocket Mud Stoves in Kenya.Boiling Point No 53, 2007.http://www.hedon.info/docs/BP53-Ingwe-3.pdf, last accessed 14.10.2013
[7]Muchiri. L. 2008. "Gender and Equity in Bioenergy Access and Delivery in Kenya." Study for the PISCES RPC. Practical Action Consulting East Africa.p. 11.http://www.pisces.or.ke/pubs/pdfs/Gender%20and%20Equity%20in%20Bioenergy%20in%20Kenya.pdf, last accessed: 14.10.2013

includes also that beneficiaries of the new technology will bear less cost from buying/searching fuel wood. Further, through more efficient fuel wood burning process less smoke is produced and air quality in the kitchen is ameliorated. Additionally, stoves have a lower risk of fire accident compared to the baseline scenario.

Figure 1: Project Flowchart



The diagram above reflects the project structure and activities. In the following the different steps are explained:

1) The project implementing partner train and certify artisans and lead artisans (in order to ensure the construction of high quality stoves);
2) The project team as well as artisans (who are working independently) create awareness about the proposed project technology and the possibility of cement subsidy;
3) Interested household gather the needed material and the artisans inform the lead artisans about the "ready to go" household. The lead artisan schedules the construction;
4) The project team provides the cement and red oxide (in Nyeri also the bricks at the customer's expenses) as well as the artisan constructs the stove;
5) The households pay the artisan and agree to render the GHG emission reduction to the implementing partner.
6) The lead artisan monitors the quality of the bricks and the stove in general. Together with the artisans she/he ensures the consumer education.

A.2. Location of project activity

A.2.1. Host Party(ies)

>>Republic of Kenya

A.2.2. Region/State/Province etc.
>>Nyeri, Kitui, Machakos and Laikipia Counties

A.2.3. City/Town/Community etc.
>>Rural Communities in the County of Kitui, Nyeri, Machakos and Laikipia

A.2.4. Physical/Geographical location
>>Kitui County is situated in the Eastern Province of Kenya. The County's principal town, Kitui town, is located at1° 22' 0" South, 38° 1' 0" East. Kitui County is organized in 10 districts and spreads out over an area of 30'496 km^2. It has a total population of around 1 Mio out of which 86 % are living in rural areas. 96 % of the active population is practicing mixed and marginal mixed farming. The poverty rate with 63.5% is much above the Kenyan average of 47 %.

Nyeri is located in the Central Province. The geographic coordinates of Nyeri, the principal town in the County, are 0° 25' 0" South, 36° 57' 0" East. Nyeri has a surface of 3337 km^2. Organized in seven districts, Nyeri counts a total population of around 700,000 people of which 75% are living in rural areas. It is partly located in the Highlands and the countryside is marked by small-scale farms that are partly producing cash crops like tea.

Machakos County is organized in 12districts, it spreads out over 6208 km^2. Machakos, the principal town of Machakos County is located at 1° 131 0″ South, 37° 16′ 0″ East. Machakos County is home to 1 million people, wherefrom 48% live in rural areas. The county's poverty rate is 59%. Its hilly scenery is characterized by many farms, which produce mainly maize, sorghum and millet. Poor farming practices and its relatively high population density of 177 people per km^2have resulted in soil erosion and environmental degradation.

Laikipia, is a county in Central Kenya and its principal town, Rumuruti, located at0° 19′ 0″ North, 36° 30′ 0″ East. Laikipia has a surface of 9462 km^2 and administers seven districts. Laikipia is estimated to have 400,000 inhabitants, wherefrom 75% live in rural areas. Poverty rate is slightly above 50%. Local economic activities include mostly agriculture and pastoral farming.

Map 1: Map of Kenya with the locations of the targeted counties (Nyeri, Kitui, Machakos and Laikipia) defining the project area. Source: https://opendata.go.ke/facet/counties, last accessed 4.12.2013

A.3. Technologies and/or measures

>>The project installs efficient cook stoves in households currently using a 3-stone open fire for cooking. The project technology employed is a brick-type rocket stove for cooking, which is made using local bricks, mud, water, cement and sand. Construction is done onsite and the materials are sourced within the vicinity of the households/homes. The stove is fixed and installed in households. Based on GiZ experience, we expect the stove to have a lifespan of 7 years.[8]The project ensures that trained artisans are available in the whole project area guaranteeing a maintenance and repair service over the whole project lifetime.

The Kitchen PerformanceTest (KPT) carried out in summer 2014 indicates that on average the stove reduces 42.4% of the firewood consumption when a family moves from using open 3-stone fire to using the rocket stove.

[8]Email exchange with GIZ Expert, Maxwell Musoka, GIZ EnDev-Kenya Country Programme Nairobi Office.

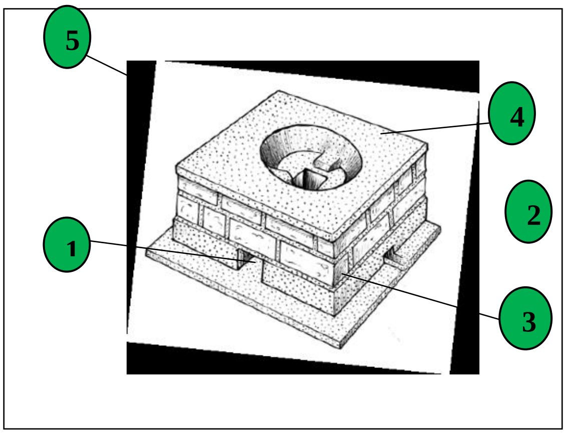

Figure 2: Rocketstove (project scenario)


Figure 3: 3-stone fire (baseline scenario)

Both in the baseline and in the project scenarios the same fuel (non-renewable biomass) is used for cooking, but with the project scenario being more efficient compared to the baseline scenario thus resulting in fuel savings and GHG reductions.

The baseline scenario is the continuation of the current practice (3-stone fires) and thus is identical to the scenario existing prior to the implementation of the project activity. Regarding facilities, systems and equipment in operation under the existing scenario prior to the implementation of the project activity, see also description of baseline scenario under point A.1.

Figure 4: Main features of the rocket stove to be disseminated



The stove has the following key features as shown in the diagram (Figure 4):
1. The firewood entrance leads to the combustion chamber. The small entrance encourages the use of small pieces of firewood, which burn more efficiently.
2. The air inlet on the side wall draws more oxygen into the combustion chamber for hotter burning.
3. Insulation around the combustion chamber ensures that the wood burns at the hottest possible temperature for complete and efficient combustion. Temperatures can go up to 600°C compared to 300°C with open fires.
4. Skirting allows the pot to sink at least 1/3 into the stove for better heat retention.
5. The combustion chamber ensures good draft. By insulating the combustion chamber to maintain maximum heat, the height can be short and contained entirely within the stove.

<u>Stove dissemination plan:</u>
As described in the LSC report, currently the project activities only take place in Kitui and Nyeri County. The start of project activity in Machakos and Laikipia is not yet decided, but would be announced in the form of a stakeholder meeting. The project plans to install approximately 41,100 stoves. The project stove dissemination plan looks as follows:

Table 1: Number of stoves constructed per year

Number of Stoves Constructed per Year	
2013	800
2014	4300
2015	6500
2016	6500
2017	7000
2018	8000
2019	8000
TOTAL	**41,100**

The project plans to phase the stove construction slowly in. This will allow the artisans to perfect their acquired knowledge and to build stoves of high quality. Further, this approach allows us to continuously develop our strategy regarding awareness creation and consumer education.
In a first phase, the construction will be limited to a small sub-area within each County. Once main project activities are completed (most household interested in the project activity are served), the project activity will move on to the next sub-area. The dissemination plan within the project area will be coordinated by our local implementation partners.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Switzerland (Annex 1)	Private entity: Fastenopfer	No
Republic of Kenya (Host)	Private entity: Fastenopfer	No

A.5. Public funding of project activity
>>No ODA is used to finance this project. See ODA declaration in the Gold Standard Passport.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology
>>Gold Standard Methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011".
Source: http://www.cdmgoldstandard.org/wp-content/uploads/2011/10/GS_110411_TPDDTEC_Methodology.pdf

Tools to which the selected methodology refers:
- UNFCCC "Tool for the demonstration and assessment of additionality", Version 07.0.0 (http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf/history_view).

B.2. Applicability of methodology

>> The methodology is applicable to activities introducing technologies that reduce GHG emissions from the thermal energy consumption of households or non-domestic premises.

This project includes the production and installation of energy efficient, wood-burning cook stoves to displace inefficient traditional, wood-burning 3-stone open fires. Reducing the consumption of unsustainably harvested fuel wood in households leads to a reduction of thermal energy consumption and associated GHG emissions.

For the applicability of the methodology the following conditions apply:

1. *The project boundary can be clearly identified, and the technologies counted in the project are not included in another voluntary market or CDM project activity (i.e. no double counting takes place).*The project boundary includes the place of the kitchens where the project stoves are applied and the place of fuel collection, production, and transport. The households in this project are not part of another carbon reduction project. This is ensured through a stove purchase agreement issued for every stove installed under this project activity. Furthermore, each stove has a unique identification number as laid out in section B.7.3. The project will list other improved stove projects in the project area to establish if any of the stoves are also included in another project, and if so exclude these stoves from the project database (see in section B.7.1. monitoring parameter “Similar cook stove project activities in the project area”).

2. *The technologies each have continuous useful energy outputs of less than 150kW per unit (defined as total energy delivered usefully from start to end of operation of a unit divided by time of operation).* From the PFT we know that a project stove uses 1.62 tons of fuel wood per year. Fuel wood has energy content of **0.0156TJ/t.**[9]Thus the maximum energy in a day is**0.000069TJ**or0.069 GJ **(1.62t x 0.0156TJ/t/365)**. Using a conversion factor of 3.6 TJ=1GWh, the daily maximum energy output can be expressed as 0.000019GWh/day. This energy is delivered in at least 1hour 30min (30 minutes breakfast, 30 minutes lunch time and 30 minutes supper time) a day.[10] Hence the power rating of the project stove is about **12.8 kW** (GWh/1.5h x 1’000’000). This is by far lower than the threshold of 150kW for thermal power output of technologies under this methodology. See excel file “150609_ER_estimation_GS2457_V3.xlsx” in spreadsheet “energy_output”

3. *The use of the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology (e.g discounted price for the improved technology) and the definitive discontinuity of its use.* Continuous use of the traditional stove (3-stone fire) shall be monitored through Monitoring/Usage Surveys. Any increase in the use of the baseline stove compared to the situation at the time of the initial KPT shall be considered in the emission reduction calculations. It should be noted that the methodology states on page 4, footnote 5, “The removal and continued non-use of three stone fires and other easily constructed traditional devices is in many cases unlikely and impractical to monitor.” The project will encourage the discontinued use of the three-stone fire through ongoing consumer education. The project team is convinced that stove usage and efficiency of the stove is maximized if end-users are repeatedly explained how to properly handle the stove. Therefore, several measures are applied. First, end-users are explained how to use the stove by the lead artisan when she/he approves the stove quality. Second, starting in summer/fall 2014, an additional brochure is distributed explaining the proper handling of the stove, third, artisans are gathered to quarterly meetings where refreshment trainings on consumer education are conducted, and fourth regular gatherings with current stove users are conducted in different areas to encourage stove users to abandon the baseline technology. Such gatherings are conducted every quarter and the importance of the ICS, its benefits, proper handling and maintenance are demonstrated and

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[9] IPCC 2006 default values for NCV of wood (Table 1.2).

[10] PDD GS Project 879, p.13. http://mer.markit.com/br-reg/public/project.jsp?project_id=103000000002050, last accessed 15.10.2014

emphasized. All these measures shall ensure that end-users are well trained about the proper handling of a stove. Enjoying high levels of cooking efficiency, households have considerably less incentive to switch back to the three stone fire. The success of these measures is monitored through a monitoring indicator that tracks the percentage of households, that still use the baseline technology regularly.

4. *The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. This must be communicated to the technology producers and the retailers of the improved technology or the renewable fuel in use in the project situation by contract or clear written assertions in the transaction paperwork.* The project communicates this information to the stove users, stove artisans and other project participants. Each stove user signs a purchase agreement where he agrees that emission reductions resulting from the use of the stove are transferred to the project implementer, who renders them to Fastenopfer, the project owner.

5. *Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rule.* This project is not introducing any new biomass feedstock. The fuel wood type in the baseline is the same as the fuel type in the project scenario.

The project fulfills all conditions and thus the methodology is applicable.

B.3. Project boundary

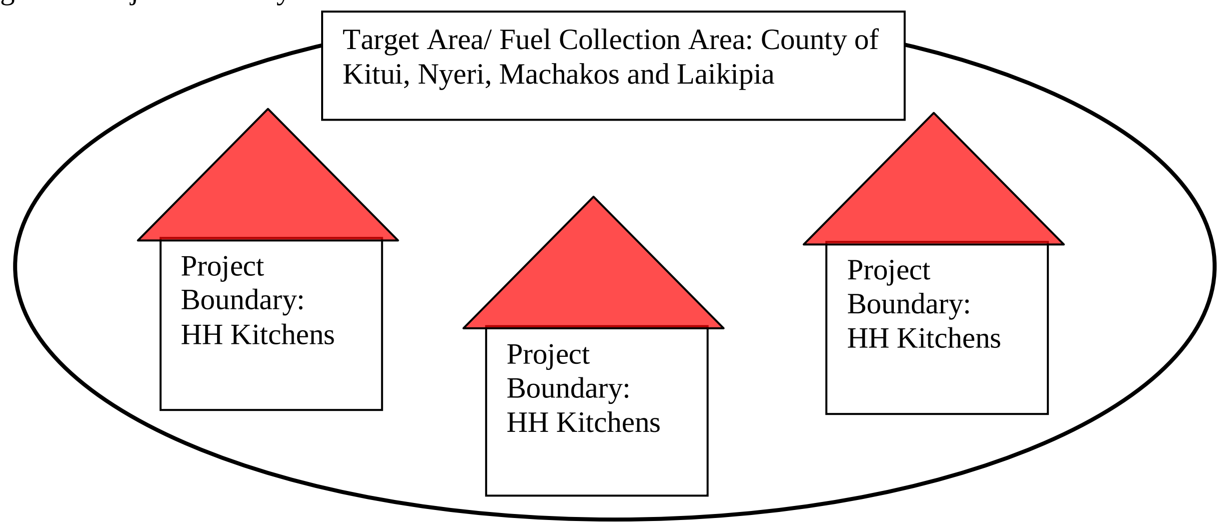
The applied methodology requests to define three parameters to delineate the project boundary. These are:

a) Project boundary: is the physical, geographical sites of the project technologies and potentially of the baseline and project fuel collection and production.
For this project the project boundary is the individual kitchen where the project stove is installed.

b) Target area: is defined by the regions, where the considered baseline scenario is assessed to be uniform. The target area provides an outer limit to the project boundary in which the project has a target population.
For this project the target area is the counties of Nyeri, Kitui, Machakos and Laikipia.

c) Fuel collection area: is defined as the area within which the woody biomass can reasonably be expected to be produced, collected and supplied.
For this project the fuel collection is the counties of Nyeri, Kitui, Machakos and Laikipia.

Figure 5: Project boundary



The following emission sources are included or excluded from the project boundary:

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Heat delivery, production of the fuel, and transport of the fuel	CO_2	Yes	Important source of emissions
		CH_4	Yes	Important source of emissions
		N_2O	Yes	Can be significant for some fuels
Project scenario	Heat delivery, production of the fuel, and transport of the fuel	CO_2	Yes	Important source of emissions
		CH_4	Yes	Important source of emissions
		N_2O	Yes	Can be significant for some fuels

B.4. Establishment and description of baseline scenario

>> A baseline scenario is defined by the typical baseline fuel consumption patterns in a population that is targeted for the adoption of the project technology.

As per applied methodology, the project proponent is required to carry out the following studies.

For the baseline:
Baseline non-renewability of biomass assessment
Baseline survey (BS) of target population
Baseline performance field tests (BFT) of fuel consumption

For the project:
Project non-renewability of biomass assessment
Project survey (PS) of target population
Project performance field tests (PFT) of fuel consumption

Most plausible baseline scenario:
For project activities targeting non-industrial applications the baseline is considered by-default fixed in time during the considered crediting period (see applied methodology: section 2, page 6). Thus a fixed baseline is applied for the first crediting period.

A. Baseline and Project non-renewable biomass (NRB) assessment

There is an official default value for fNRB for Kenya published by the CDM, which was approved by the Kenyan DNA (http://cdm.unfccc.int/DNA/fNRB/index.html). The official CDM default value of **92%** is applied for this project activity.
As per applied methodology (page 25) the non-renewable biomass fraction is fixed and the project proponent may at any time over the course of a project activity choose to re-examine renewability by conducting a new NRB assessment. In case of a renewal of the crediting period and as per GS rules, the NRB fraction must be reassessed as any other baseline parameters and updated in line with most recent data available.

B. Baseline and Project Surveys (BS and PS)

A combined baseline and project survey was conducted where data on both the use of a 3 stone fire and a project stove were collected. The steps below were undertaken:

i) Survey Representativeness

Household were randomly selected in Kitui and in Nyeri to ensure representativeness of sample for project population. There is only one scenario representing the baseline situation, which is the domestic cooking using a 3-stone open fire for cooking in the baseline with firewood.

ii) Survey Sample Sizing

As per applied methodology a survey needs to be carried out for each baseline and project scenario using representative and random sampling, following the guidelines for minimum sample size:

- Group size <300: Minimum sample size 30 or population size, whichever is smaller
- Group size 300 to 1000: Minimum sample size 10% of group size
- Group size > 1000 Minimum sample size 100

Table 2: Survey sample size

Scenario	Population size (stoves constructed until end of February 2014)	BS/PS sample size
One scenario was established: households cooking on 3-stone fire using firewood in the baseline	111 in Kitui and 60 in Nyeri	55 in Kitui and 30 in Nyeri

For the BS and PS a sample size of 85 households was adopted. Sampling approach and representativeness is in detail discussed in the BS/PS report.

iii) Data Collected

The data collected was specific to the characteristics of the baseline and project scenarios, and gathered information about each of the following:

1. User follow up
   a. Address or location
2. End user characteristics
   a. Number of people served by baseline and project technology
   b. Typical baseline technology usage patterns and tasks (commercial, institutional, domestic, etc.)
3. Baseline/project technology and fuels
   a. Types of baseline/project technologies used and estimated frequency
   b. Types of fuels used and estimated quantities
   c. Seasonal variations in technology and fuel use
   d. Sources of fuels; (purchased or hand-collected, etc) and prices paid or effort made (e.g. walking distances, persons collecting, opportunity cost)
   e. Renewability and non-renewability indicators (in case required by applied methodology)

Main findings:

Baseline scenario:

- The survey reveals that the baseline is a 5.6 person household using a 3-stone fire and collecting fuel wood (77% versus 23% buying fuel wood).
- 85% indicate spending less than 7 hours a week collecting fire wood.
- 91% indicate spending less than 500 KES per week on fire wood.

Project scenario:

- In the project scenario 75% indicate collecting fire wood, while 25% buy it.
- 94% indicate using less than 5 hours a week collecting fire wood.
- 77% indicate spending no more than 150 KES per week on fire wood.

Fuel savings:
- In the baseline, 62% of all households indicate using 100 to 150 wood sticks per week.
- In the project scenario, 65% of all households use no more than 35 wood sticks per week. The average of the whole sample is 34 wood sticks.
- 25% of all households report fuel savings of 80 to 110 wood sticks per week. Only 18% of all households have lower saving rates.

C. Baseline and Project Performance Field Test (BFT and PFT)

A paired Performance Field Test was conducted where fuel use was established when a family cooks on a traditional (3 stone fire) and then after a period of seven days the same house was allowed to cook on The rocket stove again for a period of seven days. To be conservative as possible the Baseline FT and Project FT in dry season (June and July 2014). From the survey findings, households indicated they tend to use more fuel during rainy seasons compared to dry seasons. Thus the BF and PF Test gave most conservative figures when done in dry season.

i) Representativeness

Household were randomly selected in Nyeri and Kitui in order to ensure representativeness of sample for project population. There is only one scenario representing the baseline situation, which is the domestic cooking using a 3-stone open fire for cooking in the baseline with firewood.

ii) Sample size

According to the applied GS methodology, sample size for the FT is recommended to be 30 (with a minimum sample size of 20). In order to arrive at good results in the FT, the methodology further gives guidance on defining the sample size based on the Coefficient Of Variation (COV) from BS/PS or other surveys available for this region. In this case, the COV was calculated based on the fuel saving results from the BS/PS. A COV of 0.4 was obtained. In the applied methodology (page 44 a minimum sample size of 30 is recommended for low COV values. Furthermore, from the BS/PS results, an attrition factor was found to be 7% (85 households were identified for the survey but 79 households were used in analysis. Therefore, the minimum recommended sample size for the FT is32 households. However, adopting a cautious approach, we have sampled 30 households in each of the two current project areas (Kitui and Nyeri), obtaining a sample size of 60 households. This approach was chosen to statistically confirm that the two project regions have similar cooking patterns. This is explained in details in section 1.2 of the FT Report.

iii) Procedure for fuel consumption measurement

For the FT, sampled households were visited and fuel wood consumption at household level was measured for a period of seven days, both for the baseline and for the project scenario.
Specifically, the steps below were followed in carrying out the FT as required by the methodology (Annex 4 page 44-48):

1) 60 households were selected for the paired FT using a random sampling method. This was done as explained in FT Report section 1.2.

2) Choosing of an appropriate test period and an appropriate time of year for the FT is important. The baseline/project survey results indicate that people tend to use more firewood during the rainy season. Therefore, in order to produce conservative results, the BFT and PFT were carried out during the dry season in June and July 2014.

3) Making sure that all households involved in the FT understand they were expected to cook normally during the test so as to capture the normal cooking behaviour. This was carried out and emphasized before the exercise started.

4) Stressing and emphasizing that families cook only on the fuel provide for the purpose of monitoring how much was used. This was made possible by enumerators visiting the household kitchen participating in the KPT at least every other day to check on the same, to add firewood to the predefined stock and to measure fuel wood consumption.

5) The number of people cooked for and number of meals was recorded in the data sheet for the test period as required by the methodology.

6) The fuel used in the FT was prepared and provided by the local implementing partner (Diocese of Kitui and Caritas Nyeri). The delivered fuelwood is the type of fuel commonly available.

7) Analysis of data was conducted as outlined in the excel file "150609_KPT_Data_V02", spreadsheet "final data sheet "using standard statistical tools.57 out of the selected 60 households, were taken into account. One test was not conducted because one family dropped out due to a family incident. Two other observations were identified as outliers and therefore excluded from the analysis. Details are provided in the FT report section 1.2.

8) After the successful completion of the exercise, a small appreciation gift was given to every household that participated in the exercise.

Summary of FT results:
As explained in section 2 of the FT report, "fuel savings per stove" were calculated. On average, weekly fuel wood savings per head fed are 22.81 kg. The SD is 9.79 and the COV is 0.43 for the data collected. The 90% confidence is 2.13, which gives 9% precision (see "150609_KPT_Data_V02"spreadsheet "final data sheet""). With this precision and according to the 90/30 rule, the mean fuel savings can be used for emission reduction calculations.[11]

Converted to the unit of a household, the mean fuel used in the traditional household was found to be2.81tonnes per year, which is 0.0077tonnes per day. The mean fuel used for a project stove was found to be 1.62tonnes per year, or 0.0044 tonnes per day. The mean saving was found to be 1.19tonnes of fuel per year or 0.0033tonnes per day.

iv) Units of emission reduction or fuel consumption

The unit of emission reduction is tCO2 per stove per day. Using a paired sample analysis, the baseline mean fuel use is found to be **0.0077t/day** and in the project scenario to be **0.0044t/day**. A paired fuel wood saving analysis shows a saving of **0.0033t/day.** The percentage precision is found to be 10% based on the 90% confidence level. Therefore, the mean value satisfies the 90/30 rule and thus the mean is the figure to be used for emission reduction calculations.

v) Calculation of emission reduction

In this project activity the baseline fuel and project fuel are the same, so are the emission factors in the baseline and project scenario. Thus, emission reductions are calculated using the equation on page 14 of the applied methodology:

$$ER_y = \sum_{b,p} (N_{p,y} * U_{p,y} * P_{p,b,y} * NCV_{b,\ fuel} * (f_{NRB,b,y} * EF_{fuel,\ CO2} + EF_{fuel,\ nonCO2})) - \sum LE_{p,y} \quad (1)$$

[11] See also „Guidelines for Performance Tests of Energy Saving Devices and Kitchen Performance Test (KPTs), Dr. Adam Harvey and Dr. Amber Tomas, http://www.climatecare.org/media/documents/pdf/ClimateCare_Guidelines_for_Performance_Tests_and_KPTsx.pdf

$\Sigma_{b,p}$	Sum over all relevant (baseline b/project p) couples
$N_{p,y}$	Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y
$U_{p,y}$	Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate (fraction)
$P_{b,p,y,}$	Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, and as derived from the statistical analysis of the data collected from the field tests
$f_{NRB,b,y}$	Fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass (drop this term from the equation when using a fossil fuel baseline scenario)
$NCV_{b,fuel}$	Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$EF_{fuel,CO2}$	CO2 emission factor of the fuel that is substituted or reduced. 112 tCO2/TJ for wood/wood waste.
$EF_{fuel,nonCO2}$	Non-CO2 emission factor of the fuel that is reduced
$LE_{p,y}$	Leakage for project scenario p in year y (tCO_2e/yr)

Leakage

The potential sources of leakage as set out in the methodology (page 11) are assessed regarding their risk.

Table 3: Potential sources of leakage

Leakage form	Estimate of risk	Justification
a) The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.	No risk	The technology displaced is the 3-stone fire, which is the major cooking method in areas outside project boundary already, as well as inside the project boundary. This technology consists of 3 stones placed on the ground and if wished could be constructed by any user by just taking 3 stones. Moreover, the 3 stone fire is the least efficient technology and it is unlikely that households applying a more efficient, more convenient and lower emitting technology (such as LPG, Kerosene, electricity) would switch back to the 3 stone fire.
b) The non-renewable biomass or fossil fuels saved	No risk	Almost90%[12] of the households in Kenya use firewood for cooking on a traditional 3-

[12]Ingwe A (2007) Rocket Mud Stoves in Kenya.Boiling Point No 53, 2007. http://www.hedon.info/docs/BP53-Ingwe-3.pdf, last accessed 14.10.2013

under the project activity are used by non-project users who previously used lower emitting energy sources.		stone fire, which is the least efficient cooking technology available. Households using this technology are at the bottom of the energy pyramid. Thus, the vast majority of non-project users use a higher emitting cooking technology. Households using other energy sources and technologies such as LPG stove, electric stove or kerosene stove (which may be lower emitting) are located higher up in the energy pyramid with higher living standard and higher expenses for fuel compared to the project's target population. Such non-project users will not give up their higher cooking comfort and go back to using firewood on a less efficient cooking technology in case project households would give away the wood saved due to application of the efficient cook stove. Thus, there is no likelihood that non-renewable biomass saved under the project activity is channeled to non-project users with lower emitting energy sources.
c) The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario	No risk	The fNRB value applied is the official CDM default value for Kenya, which was also approved by the Kenyan DNA. There is no known CDM or VER project activity in the project area and thus no likelihood the project will affect another CDM or VER project activity for its NRB fraction.
d) The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology	No risk	Only in the area of Nyeri space heating is used by a majority of households (73%) due to its relatively low average temperature of 11 degree Celsius during the two coldest months of the year. However, the kitchen is usually separate from the main house. While the cooking is done on open 3-stone fire(baseline), respectively the energy cookstove (project scenario) in the kitchen, space heating is used in the main house relying on portable charcoal stoves. This practice has not changed with the project implementation. Hence, as shown by the BS/PS results, space heating is not a concern for leakage as it is not combined with cooking.
e) The project stipulates substitution within households who commonly used a technology with relatively lower emissions.	No risk	The baseline stove is the 3-stone fire, which has higher emissions than other cooking devices available. The project specifically targets households using the 3-stone fire prior to the project.

Leakage risks are deemed negligible as discussed in the tables above.

$\Sigma LE_{i,y} = 0$

Table 3 (continued)Forms of possible project emissions:

f) CO2emission caused by the production and transportation of stove bricks.	Negligible	The project has investigated the carbon leakage danger of significant CO2 emission caused by the production and transportation of bricks, an essential component of the disseminated cooking technology. This assessment is necessary, as bricks in Nyeri are produced for the purpose of stove construction. It was found that CO2 emission of brick production and transportation accounted for a maximum of 1.27% of expected CO2 ER from any given stove (seeexcel file “150609_ER_estimation_GS2457_V3”, spreadsheet “production_transport_emissions”. Consequently, the impact of brick production and transportation on overall CO2 ER is negligible.

Project emissions are deemed negligible as discussed in the table above, because the emissions generated are lower than 5% of the expected CO2 ER (c.f. GS methodology p.34).

B.5. Demonstration of additionality

>> The CDM “Tool for demonstrating and assessing additionality, version 07.0.0” was used for assessing and demonstrating the additionality of this project. The following steps were undertaken.

Pre-announcement check:
The project has never been publicly announced to be implemented without carbon finance. The table below summarizes the most important steps of the project development.

Table 4: Timeline of project history:

Date	Decision	Source
January 2011	Project pilot phase in Kitui	Project Contract
June 2011	First discussions between Fastenopfer and myclimate about developing a cook stove project as a carbon offset project	Email
June 2012	Project pilot phase in Nyeri	Project Contract
27 May 2013	A project-contract has been signed between Diocese of Kitui and Fastenopfer	Contract
01 June 2013	A project-contract has been signed between Caritas Nyeri and Fastenopfer	Contract
18 June 2013	Stakeholder meeting in Nyeri conducted according to GS requirements	Stakeholder Report
20 June 2013	Stakeholder meeting in Kitui conducted according to GS requirements	Stakeholder Report
01 Aug 2013	Stakeholder report uploaded to Gold Standard registry	GS registry
16 Sept 2013	Training of stove artisans	Participants lists

Oct 2013	Start with production and dissemination of first stoves	Sales record
Mai 2014	2nd Training of stove artisans in Nyeri	Participants lists

Step 0: Demonstration whether the proposed project activity is first-of-its-kind
This step is optional. If it is not applied, the project shall be considered not first-of-its-kind. The applied methodology has its own rules for first-of-its-kind assessment (page 9): "[…] where it can be shown that the project technology has been adopted by less than 20% of the population in the target area, the technology can be qualified as first-of-its-kind".
Step 0 is optional and not applied.
Outcome of step 0: Step 0 is optional and not applied. Instead the barrier analysis is applied.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:
In the absence of implementing the project as a GS VER project, households in project area could meet their cooking needs by either of the following alternatives:

a) Continued use of 3-stone open fire cooking method (continuation of current situation)
b) Cooking using charcoal
c) Cooking using kerosene
d) Cooking using biogas
e) Cooking using Liquefied Petroleum Gas (LPG)
f) Cooking using Electricity
g) Cooking using an improved wood stove from a project that is not registered as a GS VER project

The different alternatives are further discussed under Step 3. Barrier analysis.

Outcome of step 1a: The realistic and credible alternative scenarios to the project activity are:

a) Continued use of 3-stone open fire cooking method (continuation of current situation)
b) Cooking using charcoal
c) Cooking using kerosene
d) Cooking using biogas
e) Cooking using Liquefied Petroleum Gas (LPG)
f) Cooking using Electricity
g) Cooking using an improved wood stove from a project that is not registered as a GS VER project

Sub-step 1b. Consistency with mandatory laws and regulations:
All alternatives comply with all mandatory applicable legislation and regulations.

Outcome of step 1b: All alternative scenarios are consistent with mandatory laws and regulation.

Step 2. Investment analysis
Step 2 or Step 3 can be conducted. Step 2 is not conducted since a barrier analysis (Step 3) is applied.

Step 3. Barrier analysis
This step is conducted in order to determine whether the proposed project activity faces barriers that:
a) prevent the implementation of this type of proposed project activity; and
b) do not prevent the implementation of at least one of the alternatives.

The CDM Guidelines for Objective Demonstration of Assessment of Barriers (Version 01) are applied where necessary to substantiate barrier analysis.

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed GS project activity:

Investment/financial barrier:

The project generates no income. Therefore, the cost of training stove artisans and distributing production materials (subsidies) cannot be covered without carbon financing. It is the specific design of the project to sell stoves at a price that is affordable to all rural households. However, the price per stove is directly paid by the family to the constructing artisan (who is working independently). On the other hand, the project subsidizes stove construction materials, such as cement and red oxide, amounting to around1000 KSH. The subsidy constitutes around 25% of the total stove installation costs. All in all, households can purchase the stoves receiving a discount ofapproximately25% of total stove installation cost. The need for subsidizing efficient cook stoves becomes clear, when we look at the poverty and income level of the target populations. According to the Kenya County Fact Sheets by the Commission on Revenue Allocation, poverty level in the project area stands at 63.5% in Kitui, 32.7% in Nyeri, 50.5% in Laikipia and 59.6% in Machakos. The population weighted average poverty rate over the whole project area is equal to 53.8%.[13] This shows that on average more than half the population in the project area face financial hurdles for the purchase of an improved cookstove to retail at approximately USD 40 without carbon finance subsidies. The share of people in the project area living in rural areas is approximately 70%.[14] Main source of income of rural communities is farming and agriculture. Kitui for example reports that for 75% of its population agriculture provides income while only 15% have income from wage employment.[15] In Nyeri, 20% of population enjoy wage employment, while in Machakos 11% have an income from wage.[16] Minimum wages for unskilled labour in Kenya is USD 57.[17] Average annual income in Kenya is USD 730 or USD 61 per month, while most of the people earn less than 1 USD per day, or less than 30 USD per month.[18] In rural areas mean monthly income of an adult person is reported to be KSH 1739 (around USD 20).[19]High poverty levels, low income levels and low levels of wage employment (low levels of secured regular income) strongly influence the target population's ability to pay for efficient cook stoves at market prices.

Thus, carbon credits play an important role in the financing of this project activity and subsidizing stove construction. In the first two years the project is entirely financed through pre-payment for future carbon credits for project start-up. The pre-payment for carbon credits cannot be paid back by other means than by carbon credits, since the project does not generate income. Once first carbon credits generate income for the project activity, it will be fully financed through revenues from carbon credits to cover for the financial gap resulting from actual project costs and income from stove sale. This clearly shows that carbon funds are critical for implementing this project activity. A significant part of the project investment is provided upfront by Fastenopfer (charitable foundation in accordance with Swiss law) as a pre-payment for expected GS VERs. This is an objective demonstration (as per CDM Guidelines for Objective Demonstration of Assessment of Barriers (Version 01), page 4/5, Guideline 6, Example 2) that

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[13] Kenya County Fact Sheets, Commission on Revenue Allocation, Dec 2011, Reference Annex p.34, p.36, p.38 and p. 52.

[14] Kenya County Fact Sheets, Commission on Revenue Allocation, Dec 2011, Reference Annexp.34, p.36, p.38 and p. 52.

[15] Food Security Report Kitui, http://www.kenyafoodsecurity.org/index.php?option=com_content&view=article&id=90&Itemid=148, last accessed 11.12.2013

[16] District Strategic Plan Nyeri 2005-2010, District Strategic Plan Machakos 2005-2010

[17] http://www.businessdailyafrica.com/Uhuru-hands-workers-14pc-raise-in-minimum-wage/-/539546/1766918/-/fhl3d5/-/index.html, last accessed 11.12.2013

[18] http://www.bbc.co.uk/news/10505801, last accessed 11.12.2013

[19] http://www.tegemeo.org/documents/work/Tegemeo-WP30-Rural-incomes-inequality-poverty-dynamics-Kenya.pdf, p. 18.

the GS actually enabled the financing of the project. This is an objective means to demonstrate the investment/financial barrier.

Technological barrier:
From the pilot phase conducted in Nyeri and Kitui in 2011 and 2012 we know that in the project areas families do not have access to improved firewood stove prior to the project. This can be attributed to lack of qualified local personnel to build the stoves, because the used brick-type rocket stove requires specialized expertise for its installation in households. Especially the dimensions of the stoves are crucial for its efficiency and therefore stove construction requires specially trained personnel. With the help of carbon finance (pre-payment) the project is able to train at least 100local artisans who will build high quality improved stoves for the households. Without the project the implementing organisations would not be able to finance the training of required artisans. Hence, the adoption of the project stove faces a technological barrier due to the lack of qualified personnel for its construction.

Barrier due to prevailing practice:
The adoption rate of improved domestic biomass stoves in Kenya is found to be below 5% in rural areas (Scode 2010[20], p. 18; Muchiri 2008[21], p. 11).Even though there are no reports on the penetration of improved cook stove specific for the County of Kitui, Nyeri, Machakos or Laikipia, it is unlikely that the rocket stove's penetration rate would be considerably higher in one of these Counties considering the low adoption figures at national level. More so the pilot projects conducted in Kitui and Nyeri found no households that had improved firewood stove prior to the project. Therefore, adoption rate for improved firewood cook stove can confidently be stated to be less than 20% in the concerned County. As outlined in the methodology, page 9, the technology qualifies for "first of its kind" and therefore faces the barrier due to prevailing practice.

Outcome of step 3a: The identified barriers that may prevent one or more alternatives are:

a) Investment/financial barrier
b) Technological barrier
c) Barrier due to prevailing practice

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):
The barriers discussed above do not affect the alternative scenario a), which is the continuation of the current situation, because:

- No investment barrier: households already own a 3-stone stove or can easily build one at no cost by taking 3 stones.
- No technological barrier: the know-how to construct a 3-stone stove is traditionally available.
- No barrier due to prevailing practice: 3-stone fire is found in almost 90%[22]of households and the use of firewood for cooking is found in over 80% of rural households[23].

Barriers that the other alternatives face:

Alternative (a): Is the continued use of a 3-stove fire. This option faces no barriers and needs no initial investment as described under Sub-step 3b.

[20]http://www.scode.co.ke/Review.doc, p.18.
[21]Muchiri. L. 2008. "Gender and Equity in Bioenergy Access and Delivery in Kenya." Study for the PISCES RPC. Practical Action Consulting East Africa, p. 11.http://www.pisces.or.ke/pubs/pdfs/Gender%20and%20Equity%20in%20Bioenergy%20in%20Kenya.pdf, last accessed: 14.10.2013
[22]Ingwe A (2007) Rocket Mud Stoves in Kenya. Boiling Point No 53, 2007.http://www.hedon.info/docs/BP53-Ingwe-3.pdf, last accessed 14.10.2013
[23]National Environment Action Plan p. 36.

Alternative (b): Recent reports indicate that charcoal usage in the rural Kenya is estimated to be around 34% while in urban areas 82% rely on charcoal. In urban areas, fuel wood being sparsely available, charcoal constitutes the preferred source of energy:[24] 2 kg of charcoal are traded at KSH 30, while 2 kg of fuel wood cost the same price.[25]In rural areas charcoal is traded at the same price as in urban areas. Fuel wood on the other hand can be collected freely or is available at low cost. In rural areas, a kg of fuel wood is traded at around KSH 1.5.[26]What is more, the charcoal stove retails at about KSH 300 (USD 3.50). In case offuel wood usage, a family does not need to invest in the 3-stone fire, as compared to the use of charcoal, where a charcoal stove has to be purchased. It is evident that in rural areas the 3-stone fire used with wood is the cheapest source of energy and that only more wealthy households can afford to cook on a charcoal stove.

Alternative (c): In Kenya, kerosene is mostly used for lighting and not for cooking.[27] This is because of the cost of kerosene being higher than the cost of wood. In fact, kerosene prices increased considerably over time, which reduced people's interest to use it as a source of energy. In January 2014, one liter of kerosene is sold at 85 KSH[28], while a liter of kerosene was sold at 37 KSH in 2003. What is more, rural areas are reported to face price mark-ups ranging between 10% to 300% compared to urban areas.[29]Therefore, it seems very unlikely that a household would opt for kerosene cooking in the absence of the project.

Alternative (d): For a household to cook using biogas, it needs to keep animals in order to supply the biogas feedstock. The family needs to be already practicing livestock keeping. Further, the family will need to have the capital to invest in a biogas plant. According to the Netherlands Development Organisation, a domestic biogas installation requires an investment from about 1155 USD.[30]This is an investment too high for most of the families in the project area with an average poverty rate of 53.8%.

Alternative (e): Cooking with LPG faces several barriers, according to a report on market barriers to clean cooking fuels in Sub-Sahara Africa[31] (the most common one being the financial barrier). In 2011,a 6-kg LPG cylinder retails at KSH 1000, and a 13 kg cylinder at KSH 2500. On average an urban family has to spend yearly 31'760 KSH when using LPG. On the other hand, yearly costs of charcoal for an urban family are estimated to be as low as 12,000 KSH.[32]These figures compared to the socio economic conditions in the project area, as explained previously, suggest that LPG adoption rate would be very low in absence of this project. According to Hedon only 1% of the Kenyan rural have access to LPG cylinders.[33] This is supported by EAC strategic paper on scaling up on energy use in Kenya that the use of LPG by households is constrained by high cost and low supply rather than the market.[34]The Kenyan National Environmental Management Authority for example reports, that in Kitui the usage of LPG is generally low in rural areas due to the high cost of LGP appliances (cylinders and cookers).[35]

[24] Kenyan Charcoal Policy Handbook, PISCES2011
[25] Kenya National Energy Policy Draft 2014, p. 128
[26] Kenya National Energy Policy Draft 2014, p. 128
[27] Comprehensive Study and analysis on Energy consumption patterns in Kenya, KIPPRA, 2010
[28]Energy Regulatory Commission website: www.erc.go.ke
[29]http://www.hedon.info/Kenya_HouseholdEnergySupply?bl=y, last accessed 7.1.2014
[30]SNV Workshop on Financing of Domestic Biogas Plants, p. 21 :http://www.hedon.info/docs/VanNes_SNVWorkshop_FinanceBiogasPlants.pdf, last accessed 18.12.2013
[31]http://www.sei-international.org/mediamanager/documents/Publications/Climate/WP_clean_cooking_fuels_21April.pdf last accessed 11.12.2013
[32]Kenyan Charcoal Policy Handbook, PISCES2011, p. 7
[33]http://www.hedon.info/KenyaCountrySynthesis, last accessed 11.12.2013
[34]http://www.eac.int/energy/index.php?option=com_docman&task=doc_download&gid=64&Itemid=70, pp2 last accessed 11.12.2013
[35]Kitui District Environment Action Plan 2009-2013, p. 72

Alternative (f): Cooking on an electric stove faces the barrier that a low percentage of the households are connected to the electricity grid. As of 2011, 28.9% of Kenyan households had access to electricity.[36] In particular, Kitui reports that only 3.8% are connected to the grid[37], whereas Machakos reports 17%.[38]Further, electricity grid mainly supply in urban centers. Since this project focuses on rural areas, it is reasonable to conclude that in the absence of the project being implemented as a carbon project, targeted families would not opt to cook with electricity.

Alternative (g): If the families were to acquire a project stove without carbon finance subsidy it will be retailing at an average installation price ofUSD40. Very few families will invest their 40 USD in buying a stove yet they can get three stones at no cost to cook with. The overall improved cookstove penetration rate is estimated to be at 5%.[39]Since the project takes place in rural areas, local market prices for improved stoves are to be expected at the upper bound. Hence, the cost burden for acquiring a stove is considerable. Therefore, in the absence of carbon finance subsidies, the adoption of an energy efficient cookstove is not a likely option for many rural families.

It can be therefore concluded that the most probable scenario, which faces no barriers, is the continued use of the three-stone fire (Alternative a). This requires no capital investment by the rural families and does not require any technical knowhow as in other cases (e.g. biogas or electricity). Therefore without the project being implemented as a GS-VER project, the household in the rural areas will continue to use the 3-stone open fire which burns non-renewable biomass inefficiently thus emitting high levels of GHG. With the help of the carbon funds the project will disseminate a more efficient stove that reduces the amount of non-renewable biomass responsible for GHG emission.

Table 5: Summary of barriers for the different alternatives:

	Alternative (a): Cooking using 3-stone fire	Alternative (b): Cooking with charcoal	Alternative (c): Cooking with kerosene	Alternative (d): Cooking using biogas	Alternative (e): Cooking using LPG	Alternative (f): Cooking using electricity	Alternative (g): Cooking with efficientstove not as a GS-VER project
Investment/ financial barrier	n/a	X	X	X	X	X	X
Technological barrier	n/a	n/a	n/a	X	X	X	X
Barrier of prevailing practice	n/a	X	X	X	X	X	X

Step 4: Common practice analysis

Sub Step 4a: The proposed GS project activity applies measures that are listed in the definition section of the additionality tool

[36]Kenya National Energy Policy Draft 2014, p. 78
[37]Kitui District Environment Action Plan 2009-2013, p. 69
[38]Machakos Strategic Plan: From Third to First World in One generation,p.5
[39]http://www.pisces.or.ke/pubs/pdfs/Gender%20and%20Equity%20in%20Bioenergy%20in%20Kenya.pdf

The proposed project applies the measure (b) Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, power generation based on renewable energy). The latest CDM Guidelines on Common Practice (Version 02.0) are applied.

Step 1:
In Kenya, work on improved cookstoves dates back to the eighties.[40] However, penetration rate of improved cookstoves remains low. Depending on the source of information, the penetration of improved cookstoves in rural Kenya is estimated to range between 5%[41] and 4.8%[42] (Ingwe 2007). In any case, the penetration rate is low. We therefore conclude that this project contributes to the dissemination of a new technology in the project area.

Step 2: Identify similar projects, which fulfill all of the following conditions:

a) The projects are located in the applicable geographical area;
b) The projects apply the same measure as the proposed project activity;
c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;
d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;
e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

a) There are several CDM and GS cook stove projects and programs under development in Kenya, however only 1 project and 5 programs have a defined project area to potentially include Kitui, Nyeri, Laikipia, and Machakos districts (see table6 below).

Table 6: Other cook stove projects in Kenya

	Number	Name	Status	Type	Region
1	GS 966	Paradigm Healthy Cookstove and Water Treatment Project	Issued	Project	46 districts (including Kitui,Nyeri, Machakos, Laikipia)
1	GS 1183 (CDM: PoA0154)	Kenya Improved Woodstove PoA	Registered	PoA	All provinces of Kenya
2	PoA0062, 7014	Improved Cook Stoves for East Africa (ICSEA)	Registered	PoA	Burundi, Kenya, Rwanda, Sudan,Tanzania, Uganda
3	PoA0070, 5336	Efficient Cook Stove Programme: Kenya	Registered	PoA	Kenya
4	PoA0185	Improved Cooking Stoves Programme of	Registered	PoA	Kenya, South

[40]"The Kenyan Household Cookstove Sector: Current State and Future Opportunities" Winrock International, E+Co and Pratical Action Consulting East Africa, 2011.P.5.
[41]Muchiri. L. 2008. "Gender and Equity in Bioenergy Access and Delivery in Kenya." Study for the PISCES RPC. Practical Action Consulting East Africa.Page 11.
[42]Ingwe A (2007) Rocket Mud Stoves in Kenya.Boiling Point No 53, 2007.http://www.hedon.info/docs/BP53-Ingwe-3.pdf, last accessed 14.10.2013.

		Activities in Africa			Africa
5	PoA0277	Top Third Ventures Stove Programme	Registered	PoA	Kenya

b) All projects apply the same measure meaning dissemination of efficient cook stoves.

c)All projects include, besides other technologies and fuels, efficient wood burning cook stoves.

d) n.a.

e) Since all projects disseminate also domestic cook stoves it is assumed that they operate within the same capacity or output range as calculated under Step 1.

f) All projects are registered and thus it is assumed that they started operations before the initiation of the GS stakeholder feedback round.

Step 3: within the projects identified in Step 2, identify those that are not CDM (N_{all}).
All projects identified under Step 2 seek CDM and/or GS registration.
Thus $N_{all} = 0$

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity (N_{diff}).

The projects identified under Step 2 apply the same technologies as this project (see table below).

$N_{diff} = 0$

Table 7: Other GS and CDM cook stove projects in Kenya

	Number	Name	Technology
1	GS 966	Paradigm Healthy Cookstove and Water Treatment Project	Portable domestic efficient wood stove Fix installed institutional wood stove
1	GS 1183 (CDM: PoA0154)	Kenya Improved Woodstove PoA	Efficient wood stove
2	PoA0062, 7014	Improved Cook Stoves for East Africa (ICSEA)	Different models of firewood stoves
3	PoA0070, 5336	Efficient Cook Stove Programme: Kenya	Fix installed domestic efficient wood stove
4	PoA0185	Improved Cooking Stoves Programme of Activities in Africa	Different types of efficient wood and charcoal stoves
5	PoA0277	Top Third Ventures Stove Programme	Efficient cook stoves running on non-renewable biomass

Step 5: calculate factor $F=1-N_{diff}/N_{all}$:
The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.

F = 1-0/0 = 1, which is greater than 0.2

$N_{all}-N_{diff}= 0- 0 = 0$, which is smaller than 3.

The factor F is zero since all projects in the applicable geographical area apply similar technologies and are developed under CDM. N_{all}-N_{diff} is also zero. The project is not common practice since not both criteria of Step 5 are fulfilled.

Outcome of Step4: The proposed project activity is not considered common practice and thus it is additional.

Conclusion
The barriers discussed above prevent the implementation of the project activity without carbon funding as well as alternative scenarios discussed. Therefore, the most likely alternative scenario, the baseline scenario, is the continued use of low efficient 3-stone fires using wood for cooking.
In conclusion, the dissemination of improved cook stoves in the target area faces several barriers, which make the project not to be implemented without carbon credits. Gold Standard registration will give the project the needed funding to overcome barriers as follows:

- Investment/financial barrier: The project investment in the first 2 years is provided upfront by Fastenopfer as a pre-payment for expected GS VERs. Financing of the project was only assured due to the benefit of the Gold Standard Registration. Further, revenues from carbon credits allow the project to subsidize stoves and sell them at a price far below actual costs making them affordable to rural households.
- Technological barrier: Skilled and properly trained artisans are not available in the project area. With the help of carbon finance (pre-payment) the project is able to train around 50 local artisans in the construction of fix installed efficient cook stoves.
- Barrier due to prevailing practice: Almost 90% of the households in the project area are still cooking on 3-stone open fires. Carbon funding will allow the project to sell stoves at affordable price. A subsidized price will help the project to overcome this prevailing practice barrier.

Based upon the analysis above, the project activity would not be implemented without carbon funds and is therefore additional.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
>> The project is the distribution of efficient cooking stoves to households that reduces GHG emissions by reducing the consumption of non-renewable firewood for cooking. The project introduces an efficient wood burning stove, a technology that reduces greenhouse gas (GHG) emissions from the thermal energy consumption of households. Thus, the methodology “Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011” is applicable. The requirements as set out in the methodology are discussed below:

1. Project boundary

a. Project Boundary:
The project boundary is defined by the domestic or institutional kitchens of the project population using the specific models of improved cook-stoves and the specific GHG-reducing measures introduced by the project. In this case the project boundary is defined as the place of the kitchens where the project stoves are applied. The project boundary includes kitchens in the Counties of Nyeri, Kitui, Laikipia and Machakos in Kenya (see PDD sections A.2 and B.3).

b. Target Area:
The target area is the area, in which the project has its target population. In this case the target area is defined as the Counties of Nyeri, Kitui, Laikipia and Machakos in Kenya.

c. Fuel Collection Area:
The fuel collection area is the area within which the biomass is produced and supplied, or could reasonably be expected to be produced and supplied, whichever is the greater. In this case the fuel collection area is the area in the Counties of Nyeri, Kitui, Laikipia and Machakos in Kenya.

2. Selection of baseline scenarios and project scenarios
The applied methodology states that where all units are non-industrial the baseline is by default a fixed baseline with no monitoring of baseline parameters during the crediting period. The baseline scenario is defined by the "typical baseline fuel consumption pattern" in the population targeted, which is a household using firewood on a 3-stone fire.
Project scenario is a fixed installed rocket stove, which is more efficient than the baseline stove.

3. Additionality
As required by the Gold Standard Methodology the most recent version of the UNFCCC's "Tool for the demonstration and assessment of additionality", in this case Version 07.0.0, is used to demonstrate additionality. The details of the additionality assessment can be found in section B.5 of this PDD.

4. Baseline emissions
Baseline emissions are calculated as outlined in the stated applied methodology. The sections B.4 and B.6.3 of this PDD describe the mode for calculating baseline emissions. Because the type of the fuel used and the respective fuel emission factors both in the baseline and in the project scenario is the same, emission reductions are calculated based on the mean fuel savings per stove (household). Thus there is no separate formula applied for baseline emission calculations.

5. Project emissions
Project emissions are calculated as outlined in the stated applied methodology. The sections B.4 and B.6.3 of this PDD describe the mode for calculating project emissions. Because the type of the fuel used and the respective fuel emission factors both in the baseline and in the project scenario is the same, emission reductions are calculated based on the mean fuel savings per stove (household). Thus there is no separate formula applied for project emission calculations.

6. Leakage
Leakage emissions are assessed as outlined in the stated applied methodology. Leakage effects for this project are assessed and discussed in section B.4 of this PDD. Leakage effects are considered to be insignificant and thus overall leakage of this project is LE = 0.

7. Emissions reduction
Emission reductions are calculated as outlined in the stated applied methodology.
We used equation 1 (page 14) where baseline and project fuels are similar:

$$ER_y = \Sigma_{b,y} (N_{p,y} * U_{p,y} * P_{p,b,y} * NCV_{b,fuel} * (f_{NRB,b,y} * EF_{fuel,CO2} + EF_{fuel,nonCO2})) - \Sigma LE_{p,y}$$

Where:

$\Sigma_{b,y}$ = sum over all relevant (baseline b/project p) couples
$N_{p,y}$ = cumulative number of project technology days included in the project database for project scenario p against the baseline scenario b in year y.
$U_{p,y}$ = cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction)
$P_{p,b,y}$ = Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, as derived from the statistical analysis of the data collected from field tests.
$NCV_{b,fuel}$ = Net calorific value of the fuel that is substituted or reduced ((IPCC default for wood fuel, 0.015 TJ/ton)

$f_{NRB,b,y}$ = fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass
$EF_{fuel,CO2}$ = CO2 emission factor of the fuel that is substituted or reduced. 112 tCO2/TJ for wood/wood waste.
$EF_{fuel,nonCO2}$ = Non-CO2 emission factor of the fuel that is reduced
$LE_{p,y}$ = leakage for project scenario p in year y (tCO2eq/yr)

In the above formula, $P_{b,p,y}$ (which is fuel savings between baseline and project scenarios) was calculated in the following way. First, with the BS/PS we confirmed the preliminary defined baseline and project scenarios. We then conducted a paired sample BFT and PFT with a randomly drawn sample from the sales record to reach within 30% of the mean at the 90% confidence interval. We calculated both daily and yearly household wood savings (Baseline wood use – Project wood use) and used the estimated mean fuel savings as $P_{b,p,y}$.For ex-ante estimations of emission reductions we assumed a usage rate ($U_{p,y}$) of 95% and a cumulative number of project days ($N_{p,y}$) of 365.

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{b,CO2}$
Unit	tCO2/t_fuel
Description	CO2 emission factor arising from use of wood-fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Tables 1.2/2.5
Value(s) applied	1.7472 tCO2/t wood
Choice of data or Measurement methods and procedures	Default IPCC values for wood / wood waste are applied
Purpose of data	Calculation of ER
Additional comment	

Data / Parameter	$EF_{b,non-CO2}$
Unit	tCO2/t_fuel
Description	Non-CO2 emission factor arising from use of wood-fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) applied	0.1356 tCO2eq/t wood (CH4: 0.1170 tCO2e/t wood; N2O: 0.0186 tCO2eq/t wood)
Choice of data or Measurement methods and procedures	Default IPCC values for CH4 and N20 emissions for wood / wood waste are applied and summed. The following GWP100 are applied: 25 for CH4, 298 for N20
Purpose of data	Calculation of ER
Additional comment	

Data / Parameter	$EF_{p,CO2}$
Unit	tCO2/t_fuel
Description	CO2 emission factor arising from use of wood-fuel in project scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Tables 1.2/2.5
Value(s) applied	1.7472 tCO2/t wood (=112.0 tCO2/TJ * 0.0156 TJ/ t)
Choice of data or Measurement methods and procedures	Default IPCC values for wood / wood waste are applied
Purpose of data	Calculation of ER
Additional comment	

Data / Parameter	$EF_{p,non-CO2}$
Unit	tCO2/t_fuel
Description	Non-CO2 emission factor arising from use of wood-fuel in project scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.5
Value(s) applied	0.1356 tCO2eq/t wood (CH4: 0.1170 tCO2e/t wood; N2O: 0.0186 tCO2eq/t wood)
Choice of data or Measurement methods and procedures	Default IPCC values for CH4 and N20 emissions for wood / wood waste are applied and summed. The following GWP100 are applied: 22 for CH4, 298 for N20
Purpose of data	Calculation of ER
Additional comment	

The parameter NCV_b and NCV_p are not applicable to this project since EF in units of tCO2/t_fuel. These parameters are therefore not listed here (see methodology page 21).

Since a fixed baseline is applied, the following baseline parameters are also known. They will not be monitored.

Data / Parameter	$P_{b,y}$
Unit	t_biomass/unit-year and t_biomass/unit-day
Description	Quantity of woody biomass consumed in the baseline scenario in year y and per day in year y.
Source of data	BFT 2014
Value(s) applied	2.81 t wood/year and 0.0077 t wood/day
Choice of data or Measurement methods and procedures	Estimated mean (justified because statistical analysis fits within 90/30 rule).
Purpose of data	
Additional comment	

B.6.3. Ex ante calculation of emission reductions

>>Because the type of the fuel used and the respective fuel emission factors both in the baseline and in the project scenario is the same, emission reductions are calculated based on the mean fuel savings per stove (household). The following equation from page 14 of the applied methodology is used:

$$ER_y = \sum_{b,p} (N_{p,y} * U_{p,y} * P_{p,b,y} * NCV_{b,\ fuel} * (f_{NRB,b,y} * EF_{fuel,CO2} + EF_{fuel,\ nonCO2})) - \sum LE_{p,y} \quad \textbf{(1)}$$

Substituting the following figures into the equation

ERy = Σ b,y (Np,y* Up,y* Pp,b,y* NCVb,fuel* (fNRB,b,y* EFfuel,CO2+EFfuel, nonCO2)) – Σ LEp,y

provides the following emission reduction per stove per year:

$\mathbf{ER}_{\mathbf{stove\text{-}year}}$ = 365 * 0.95 * 0.0033 * (0.92 * 1.7472 + 0.1356) – 0 = **2.0 $\mathbf{tCO_{2eq}}$**

Comments:

- Fuel saving per day per stove being fuel combusted per day for baseline scenario minus fuel wood combusted per day for the project scenario. This yields **0.0077t –0.0044t = 0.0033t wood/day/stove**
- NCV was excluded because EF was in units of tCO2e/t fuel as per methodology (page 21).

Table 8: Relevant emission factors are calculated and given as:

CO2 emission factor for wood		
item	value	
EF wood (tCO2e/TJ)	112	IPCC default 2006 (Table 2.5)
NCV wood (TJ/ton fuel)	0.0156	IPCC default 2006 (Table 1.2)
EF wood (tCO2e/t fuel)	1.7472	calculated
CH4 emission factor		
item	value	
EF wood (tCH4/TJ)	0.3	IPCC default 2006 (Table 2.5)
GWP CH4	25	GWP for second commitment period: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
wood tCO2e/TJ	7.5	calculated
NCV wood (TJ/ton fuel)	0.0156	IPCC default 2006 (Table 1.2)

EF wood tCO2e/t fuel	0.1170	calculated
N2O emission factor		
item	value	
wood tN2O/TJ	0.004	IPCC default 2006 (Table 2.5)
GWP N2O	298	GWP for second commitment period: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
wood tCO2e/TJ	1.192	calculated
wood TJ/ton fuel	0.0156	IPCC default 2006 (Table 2.5)
EF wood tCO2e/t fuel	0.0186	calculated

non-CO2 emission factor for wood

item	value
EF wood tCO2e/t fuel	0.1356

Table 9:Ex-ante calculation of emission reductions (copy of the excel spreadsheet):

Annual ER (tCO2e)

Item	Unit	Value	Source
Project Technology Days (N)	days	365	assumption
Cumulative Usage Rate (U)	fraction	0.950	assumption
Fuel Savings (P)	t wood/day-stove	0.0033	calculated from PFT 2011
Non-renewable biomass fraction	fraction	92%	CDM default value
Net Caloric Value*	TJ/t wood	n.a	IPCC 2006 default
EF wood, CO2	tCO2e/t wood	1.7472	IPCC 2006 default
EF wood, nonCO2	tCO2e/t wood	0.1356	IPCC 2006 default (CH4 + N2O)
Leakage LE	tCO2e/t year	0	assumption

*not used if EF is in tCO2/t fuel

Total ER (tCO2e/year-stove)	**2.0**
Total BE (tCO2e/year-stove)	**4.6**
Total PE (tCO2e/year-stove	**2.7**

Baseline fuel consumption

Item	Unit	Value	source
Wood combusted	t/year/stove	2.81	KPT 2014
Wood combusted	t/day/stove	0.0077	calculated

Project fuel consumption

Item	Unit	Value	source
Wood combusted	t/year/stove	1.62	KPT 2014
Wood combusted	t/day/stove	0.0044	calculated

Fuel Savings

Item	Unit	Value	source
Wood savings	t/year/stove	1.19	calculated
Wood savings	t/day/stove	0.0033	calculated

The emission reduction ER for the project per year is found to be **2.0tCO2e/stove-year**. Baseline emission, **BE** is calculatedas**4.6tCO2e/stove-year** where as project emission, **PE,** is calculated as **2.7tCO2eq/stove-year.** There is no leakage associated with this project hence **LE=0.**

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	12,469	714	0	5285
Year 2	37,562	21,642	0	15,920
Year 3	67,766	39,045	0	28,721
Year 4	98,570	56,794	0	41,776
Year 5	133,692	77,030	0	56,662
Year 6	170,867	98,450	0	72,417
Year 7	190,984	110,040	0	80,943
Total	711,910	410,186	0	301,724
Total number of crediting years	7			
Annual average over the crediting period	101,701	58,598	0	43,103

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Since a fixed baseline scenario is applied, the baseline parameters mentioned under B.6.2. are not monitored.

Data / Parameter	$f_{NRB,i,y}$
Unit	Fractional non-renewability (%)
Description	Non-renewability status of woody biomass fuel in scenario I during year y
Source of data	CDM default value: http://cdm.unfccc.int/DNA/fNRB/index.html
Value(s) applied	92%
Choice of data or Measurement methods and procedures	The CDM default value for fNRB published on the CDM website for Kenya and approved by the Kenyan DNA is applied.
Monitoring frequency	Fixed by baseline study for a given crediting period, updated if necessary as specified in section III.1
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Calculation of ER
Additional comment	The applied methodology states on page 25: “"The non-renewable biomass fraction is fixed based on the results of the NRB assessment. Over the course of a project activity the project proponent may at any time choose to re-examine renewability by conducting a new NRB assessment. In case of a renewal of the crediting period and as per GS rules, the NRB fraction must be reassessed as any other baseline parameters and updated in line with most recent data available".

Data/Parameter	$P_{p,y}$
Unit	t_biomass/unit-year and t_biomass/unit-day
Description	Quantity of woody biomass consumed in the project scenario in year y and per day in year y.
Source of data	PFT, FT updates, and any applicable adjustment factors
Value(s) applied	1.62 t wood/year and 0.0044t wood/day
Measurement methods and procedures	Performance Field Tests conducted and analysed according to the requirements of the methodology “Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011”
Monitoring frequency	Updated every two years
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	
Additional comment	A single project fuel consumption parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

Data / Parameter	$U_{p,y}$
Unit	Percentage
Description	Usage rate in project scenario p during year y
Source of data	Annual usage survey
Value(s) applied	95% (ex-ante)
Measurement methods and procedures	Conducting usage surveys as required by the methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011"
Monitoring frequency	Annual
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Calculation of stove usage
Additional comment	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

Data / Parameter	$N_{p,y}$
Unit	Project technologies credited (units)
Description	Technologies in the project database for project scenario p throughout year y
Source of data	Sales record/Project database
Value(s) applied	To be determined after monitoring
Measurement methods and procedures	The number of project technology days between the installation date of each stove and the end of the monitoring period is calculated and then adjusted for the 21 days time period between date of sale and start of stove usage for households (for drying the new stove).
Monitoring frequency	Continuous
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Calculation of stove usage
Additional comment	The total sales record is divided based on project scenario to create the project database.

Data / Parameter	$LE_{p,y}$
Unit	t_CO2eq per year
Description	Leakage in project scenario p during year y
Source of data	Baseline and monitoring surveys
Value(s) applied	0
Measurement methods and procedures	Interviewing households with baseline and monitoring surveys
Monitoring frequency	Every two years
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Assessment of leakage
Additional comment	Aggregate leakage can be assessed for multiple project scenarios

Data / Parameter	Similar cook stove project activities in the project area
Unit	Number of projects and/or extent of overlap
Description	List of similar cook stove projects and an assessment of how (e.g. target population, cook stove type, etc.) and to what degree overlap occurs
Source of data	Various sources (CDM pipeline, GS registry, etc.)
Value(s) applied	N.A.
Measurement methods and procedures	N.A.
Monitoring frequency	Annual
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Avoidance of double counting
Additional comment	

Data / Parameter	Incentive scheme to abandon baseline technology (3-stone fires)
Unit	Percentage of households
Description	Percentage of households that use the baseline technology (3-stone fires) regularly (every day use) in addition to the project stove
Source of data	Monitoring/Usage Surveys
Value(s) applied	N.A.
Measurement methods and procedures	Interviewing households with monitoring/usage surveys
Monitoring frequency	Annual
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Calculation of project emissions.
Additional comment	

The following project parameter from the PFT is also known at validation, but it will be monitored and updated if needed during the crediting period.

Data / Parameter	$P_{p,b,y}$
Unit	t_biomass/unit-year and t_biomass/unit-day
Description	Quantity of woody biomass saved due to project activity in year y and per day in year y.
Source of data	PFT 2014
Value(s) applied	1.19 t wood/year and 0.0033t wood/day
Choice of data or Measurement methods and procedures	Estimated mean (justified because statistical analysis fits within 90/30 rule).
Purpose of data	
Additional comment	

The sustainable development parameters will be monitored as explained in an extract below from GS passport:

Table 10: Sustainable development indicators

N	Indicator	Parameter	Data source
1	Air quality	Chosen parameter: *# of positive comments from stove users* Future target for parameter: *90% positive comments from users*	Household interviews for Monitoring Survey
2	Quality of Employment	Chosen parameter: Number of artisans trained and active over time Future target for parameter: *It is expected to train about 100 artisans/lead artisans* *It is expected that 60% of trained artisans are present during the quarterly artisan meeting one year after completing the training.*	Training records Quarterly Artisan Meeting records
3	Livelihood of the poor	Chosen parameter: *Time and money savings per week due to reduced fuel consumption* Future target for parameter: *Time savings: HH spends 1.5h less per week collecting firewood* *Monetary saving: HH spends 50KSH less per week on firewood*	Household interviews for Monitoring Survey
4	Access to affordable and clean energy services	Chosen parameter: *Number of households using efficient cook stoves at end of project* Future target for parameter: *41,100 cook stoves are constructed at end of project.*	Sales record
5	Human/institutional capacity	Chosen parameter: *Number of women trained as artisans and active over time* Future target for parameter: *Approximately 25% of trained artisans are women* *It is expected that 60% of trained women artisans are present during the quarterly artisan meeting one year after completing the training.*	Training records Quarterly Artisan Meeting records
6	Quantitative employment and income generation	Chosen parameter: *Number of people receiving income from project activity* Future target for parameter: *Approx. 4 project staff (project coordinator, project officer, data officer, accountant) and 5 lead artisans are employed per project area.*	Employment records and financial records

B.7.2. Sampling plan

>>The applied methodology defines minimum sample sizes for the different monitoring activities and requires random and representative sampling methods (pages 10, 13, 43). Below minimum sample sizes and required sampling methods are listed for each monitoring activity.

1. Monitoring surveys

Sample size:	Group size <300: Minimum sample size 30 or population size, whichever is smaller Group size 300 to 1000: Minimum sample size 10% of group size Group size > 1000 Minimum sample size 100 (meth. p. 10)
Sampling approach:	Common sampling approaches such as clustered random sampling are allowed and geographic distribution should be factored into the selection criteria (meth. p. 23)
Representativeness:	The monitoring survey will only be conducted with end users representative of the project scenario and who will be using the project technology at the time of the survey (meth. p. 24)
Comments:	Monitoring survey can be conducted with usage survey participants that are currently using the project technology (meth. p. 24)

2. Usage surveys

Sample size:	Total minimum sample size is 100, with at least 30 samples for project technologies of each age being credited (meth. p. 24)
Sampling approach:	Random sampling approaches
Representativeness:	To ensure conservativeness, participants in a usage survey with technologies in the first year of use (age0- 1) must have technologies that have been in use on average longer than 0.5 years. For technologies in the second year of use (age1-2), the usage survey must be conducted with technologies that have been in use on average at least 1.5 years, and so on (meth. p. 24)
Comments:	Monitoring survey can be conducted with usage survey participants that are currently using the project technology (meth. p. 24)

3. Project FT Update

Sample size:	Minimum sample size is greater than 20 (meth. p. 13) Sample size attrition should be considered to achieve minimum number of valid results (meth. p. 44)
Sampling approach:	Any sampling methods can be used, provided that the sample is selected randomly (meth. p. 43)
Representativeness:	90/30 rule: When the sample sizes are large enough to satisfy the “90/30 rule,” i.e. the endpoints of the 90% confidence interval lie within +/- 30% of the estimated mean, overall emission reductions can be calculated on the basis of the estimated MEAN annual emission reduction per unit or MEAN fuel annual savings per unit (meth. p. 13)
Comments:	

B.7.3. Other elements of monitoring plan

>>The applied methodology requests the following continuous and periodic monitoring activities:

The monitoring tasks undertaken continuously are:

A. Total Sales Record
The following data shall be recorded for all sold stoves;
1. Date of sale
2. Geographic area
3. Model/type of project technology sold
4. Quantity of project technologies sold
5. Name and telephone number (if available), and address:
6. Mode of use: domestic
7. Stove identification number
8. GPS coordinates

Each project stove has a unique identification number, which is for example K/KNG/00008, for a stove built in Kitui Kanyangi. Another example isCN/END/GTG/00154/14 for a stove built by Caritas Nyeri in Endarasha parish, Gitegi village in the year 2014.

B. Project Database
The project database is derived from the total sales record with project technologies differentiated by different project scenarios. The differentiation of the project database into sections is based on the results of the applicable monitoring studies for each project scenario in order that ER calculations can be conducted appropriately section by section.

C. Ongoing Monitoring Studies
The following ongoing monitoring studies will be conducted for the project scenario following verification of the associated initial project studies. These monitoring studies will investigate and define parameters that could not be determined at the time of the initial project studies or that change with time.

a)Monitoring Survey – This shall be completed annually, beginning 1 year after project registration
The monitoring survey shall investigate changes over time in a project scenario by surveying end users with project technologies on an annual basis. It will provide critical information on year-to-year trends in end user characteristics such as technology use, fuel consumption and seasonal variations.

<u>Monitoring Survey Representativeness:</u>
End users from a given project scenario will be selected using representative sampling techniques to ensure adequate representation of users with technologies of different ages. Common sampling approaches such as clustered random sampling will be used. End users will be surveyed once a year with care taken to collect information pertaining to seasonal variations in technology and fuel use patterns. As the project expands to other areas, monitoring surveys will guarantee that noticeable differences are detected and if needed new scenarios or appropriate adjustment factors will be defined.

<u>Monitoring Survey sample sizing and data collection:</u>
The monitoring survey has the same sample sizing and data collection guidelines as the baseline survey, but in this case, the monitoring survey will only be conducted with end users representative of the project scenario and who will be using the project technology at the time of the survey.

b)Usage Survey – completed annually
The usage survey provides a single usage parameter that is weighted based on drop off rates that are representative of the age distribution for project technologies in the total sales record. A usage parameter must be established to account for drop off rates as project technologies age and are replaced. A usage parameter is required prior to any request for issuance.

The minimum total sample size will be 100, with at least 30 samples for project technologies of each age being credited. The majority of interviews in a usage survey must be conducted in person and include expert observation by the interviewer within the kitchen in question. The usage survey will establish a useful lifetime for technologies after which they are removed from the project database and no longer credited

c) Project FT Update – completed every other year (every two years)
The PFT update is an extension of the project PFT and provides a fuel consumption assessment representative of project technologies currently in use every two years. Hence the PFT update shall account for changes in the project scenario over time as project technologies age and new customers are added, also as new models and designs are introduced. It is legitimate to apply an Age Test instead of a PFT, to project technologies which remain materially the same year after year.

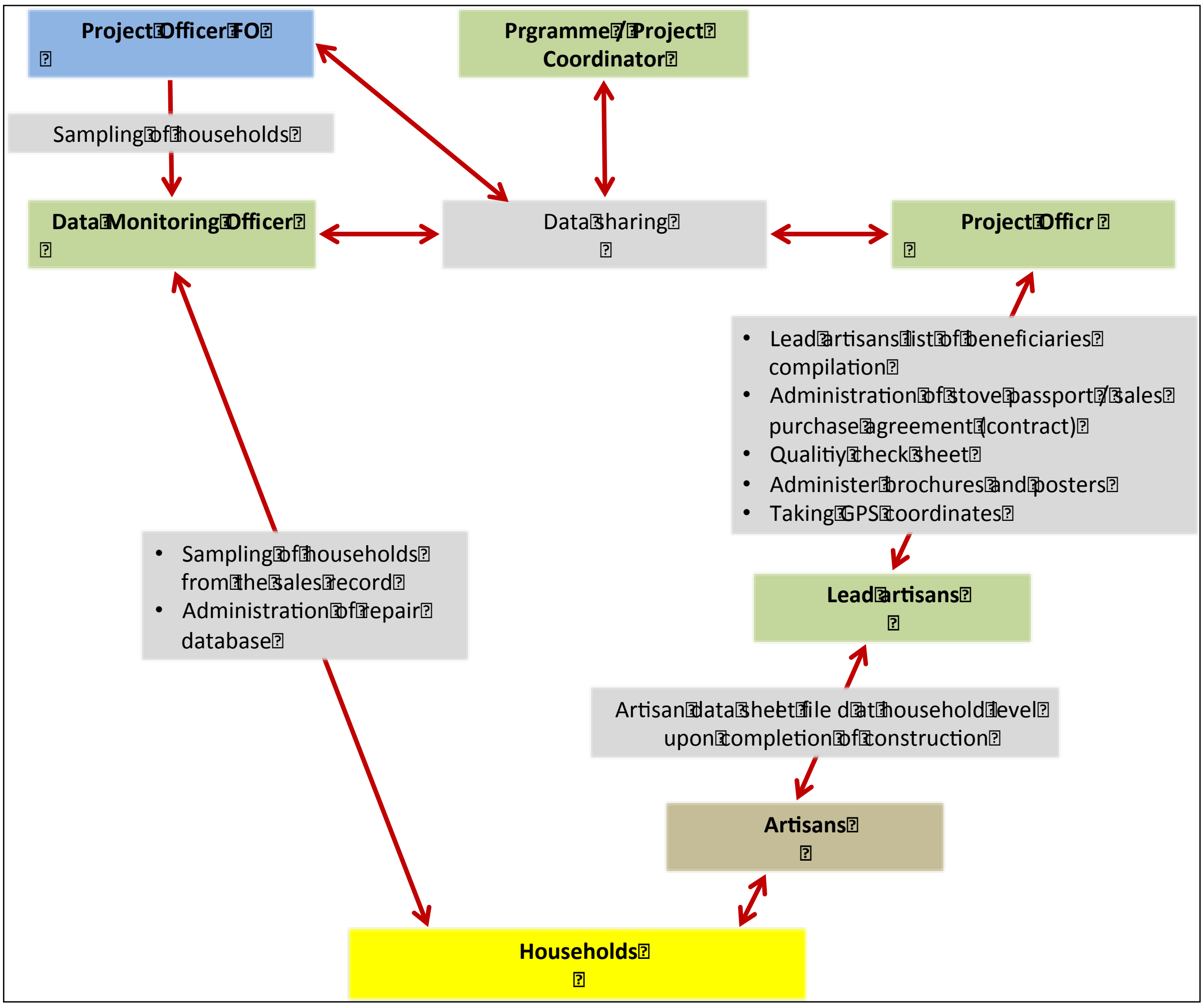
d) Baseline FT Update
A fixed baseline is adopted in this project and FT Update is thus not required.

e) Leakage Assessment – Completed every other year, starting on time for the first verification.

f) Non-Renewable Biomass Assessment Update
The non-renewable biomass fraction is fixed based on the results of the NRB assessment.
In case of a renewal of the crediting period and as per Gold Standard rules, the NRB fraction will be reassessed as any other baseline parameters and updated in line with most recent data available.

Management of monitoring activities
The organization of monitoring activities in each project region looks as follows:

Figure 6: monitoring management structure



In each project region, the data monitoring officer is main responsible for gathering the data from the project officer and compiling the sales record/ database. It is her/his duty to cross-check data accuracy by visiting randomly selected households. Furthermore, she/he is in charge of carrying out project surveys and kitchen performance tests. The compiled data is delivered to the Fastenopfer project officer, who is in charge of administrating the overall project database. Furthermore, the Fastenopfer project officer supports the data manager in analyzing surveys and kitchen performance test data. Extensive information regarding the monitoring procedures of this project is provided in the QA/QC & Monitoring Manual.

QA/QC for monitoring activities

Stove maintenance is key in ensuring project quality, The project ensures that trained artisans are available in the whole project area guaranteeing a maintenance and repair service over the whole project lifetime. Quality assurance and quality control for monitoring activities take place on several levels. First, accuracy of the stove information is checked by the data monitoring officer, who regularly visits selected households. Second, the number of constructed stoves has to match the quantity of distributed material (bags of cement and red oxide), which is recorded in the material management sheet. Fastenopfer project officer together with project officers of implementing organisations are in charge of this control mechanism. Third, the distributed material together with the stored material has to match the quantity of purchased material. This cross check is carried out by the project officer of the implementation organisations. Data in form of hard copies is archived in securely locked places in the headquarters of each project area. Soft data is saved continuously via email and on external disks. Extensive information regarding the quality assurance & quality control mechanisms, as well as data storage of this project is provided in the QA/QC & Monitoring Manual.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
>>The starting date of the project activity is 20/09/2013 (date when the first project stove was constructed and sales purchase agreement signed)

C.1.2. Expected operational lifetime of project activity
>> 21 years 0 months

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>> Renewable

C.2.2. Start date of crediting period
>>01/01/2014, or 2 years before date of registration dependent on which is the later date.

C.2.3. Length of crediting period
7 years 0 months

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>Analysis of environmental impacts is outlined in the sustainability matrix in the Gold Standard Passport.

D.2. Environmental impact assessment
>> The host country does not require an Environmental Impact Assessment for the proposed project activity. In THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT, 1999 No 8 of 1999, the SECOND SCHEDULE (s.58(1), (4)) lists project types that need to undergo a EIA (see page 36, 37). The construction and dissemination of efficient cook stoves does not fall within the project types that require an EIA.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
>> See report on local stakeholder consultation.

E.2. Summary of comments received
>> See report on local stakeholder consultation.

E.3. Report on consideration of comments received
>> See report on local stakeholder consultation.

SECTION F. Approval and authorization
>> N.A.

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Appendix 1: Contact information of project participants

Organization name	Fastenopfer
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Appendix 2: Affirmation regarding public funding

See Annex 1 in the Gold Standard Passport (ODA declaration).

Appendix 3: Applicability of selected methodology

See section B.2 in this PDD.

Appendix 4: Further background information on ex ante calculation of emission reductions

See Excel file “150609_ER_estimation_GS2457_V3”.

Appendix 5: References and Sources

"A Comprehensive Study and Analysis on Energy Consumption Patterns in Kenya – A Synopsis of the Draft Final Report", Kenya Institute for Public Research and Analysis, 2010.

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
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