CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

Title: Meru Improved Cook Stoves
Version: 8.0
Completion date: 0324/032/2016

Version history:
1.0 Pre-validation
2.0 Revised methodology
2.2 Draft Validation Report CARs and CLOs
2.3 Draft Validation Report CARs and CLOS updated
3.0 Validation updates
4.0 Validation updates
5.0 Validation updates
6.0 Validation Updates
7.0 Validation Updates
8.0 Design Change

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

Background to and purpose of project

In Kenya 70% of the national energy supply is met through use of biomass fuels, with 90% of this demand coming from the domestic sector.[1] Traditional cooking involves the use of a 3-stone fire, which amongst other shortfalls is only able to produce 10% thermal efficiency.[2] Combined with a population growth rate of 2.7%[3] it is not surprising to find that between 1990 and 2005 Kenya lost forest coverage at a rate of 0.3-0.5%/year, with protected forest making up only 1.6% of land coverage by 2005.[1,3] This situation is not sustainable and Kenya's ability to meet future energy needs under a business-as-usual scenario is questionable, as highlighted by the Kenyan Ministry of Energy in a 2002 report.[4] The burning of significant quantities of non-renewable biomass also gives rise to large quantities of greenhouse gasses, contributing to anthropogenic climate change.

Field Code Changed
Field Code Changed

Added to environmental pressures is the poor quality of life experienced by the rural poor, using traditional wood stoves which generate a large amount of smoke within the home due to poor combustion efficiencies. A WHO report concluded *'Indoor air pollution is a major environmental and public health hazard for many of the world's poorest, most vulnerable people.'* Biomass smoke has been linked to a range of health problems such as acute respiratory infections (ARI) in children, chronic obstructive lung

[1] "Kenya: Integrated assessment of the Energy Policy", UNEP, 2006 : http://www.unep.ch/etb/areas/pdf/Kenya%20ReportFINAL.pdf

[2] UNFCCC Methodology AMS-II-G http://cdm.unfccc.int/UserManagement/FileStorage/AUBHMWJVKFSY9D1380NOI5ET26ZQLG

[3] "State of the world's forests 2009", FAO, 2009 : http://www.fao.org/docrep/011/i0350e/i0350e00.HTM

[4] "Study on Kenya's energy demand, supply and policy strategy for households, small scale industries and service establishments", Republic of Kenya Ministry of Energy, 2002.

diseases (such as chronic bronchitis and asthma), lung cancer and pregnancy-related outcomes. It is estimated that 4-5% of global deaths occur as a result of exposure to smoke particulates.[5]

The 'Meru Improved Cook Stove project' will address these issues by the distribution of approximately 820,000 domestic wood-burning improved cook stoves in households within the project area. Recipients will receive stoves in exchange for CO_2e rights, thanks to the carbon revenues expected and be directed in correct use of the stove by local community groups engaging with the project developers. Pilot studies have shown the stoves to reduce fuel consumption significantly[6]. This will result in an improved living environment for recipients and reduced pressure on local forests, with a reduction of wood being burnt annually as a result of the project. By reducing fuel consumption, CO_2 emissions from combustion of non-renewable biomass will be correspondingly reduced.

As the stoves will be distributed without monetary charge, the project can expect to achieve high levels of market saturation in an area, allowing as many households as possible to benefit from the improved stove. The way in which a cook uses the stove is also a key influencing factor in the fuel savings made.[7] It is expected therefore that by making such improved stoves commonplace within a community, and hence building strong local understanding of the technology, higher levels of fuel savings will be achieved.

Technology to be employed

Pilot studies have shown the large majority of households within the project area to be cooking for domestic purposes only, on three-stone fires using wood fuel. There is one main representative household cluster. For these reasons the project will initially employ a single model of wood-burning stove, which will be distributed for domestic use only. More advanced and efficient models of stove are currently under development and may be included in the project if available at the appropriate time. If this should occur the appropriate clustering would be organised.

The improved stoves (known as the Carbon Zero Kenya or CZK stove) are a fixed construction of an inner ceramic liner surrounded by extruded clay components and mortar, using a 'rocket' style design. This consists of a horizontal (combined) fuel and air intake, terminating in a firebox with a vertical outlet on which the cooking pot rests. Relative to the three stone fire, this type of stove allows higher combustion temperatures to be reached and improved fuel/air mixing, hence higher levels of combustion are achieved. This reduces the amount of smoke produced. There is no chimney as such, draft is created by the temperature difference between the low inlet and the outlet, and the hot combustion gasses pass out of the top directly onto the cooking pot in order to achieve high levels of thermal transfer. Despite the combustion gasses remaining in the house, the improved combustion efficiencies mean that smoke levels are dramatically reduced.

[5] "The health effects of indoor air pollution exposure in developing countries", WHO, 2002 : http://whqlibdoc.who.int/hq/2002/WHO_SDE_OEH_02.05.pdf

[6] Refer to file 'PDD supplementary calculations v.02' for details.

[7] Page 10 "Solid fuel household cook stoves: characterisation of performance and emissions", Biomass and bioenergy 33 (2009) 294-305. http://www.pciaonline.org/files/Stoves_Paper_Final_Color_2.26.09.pdf

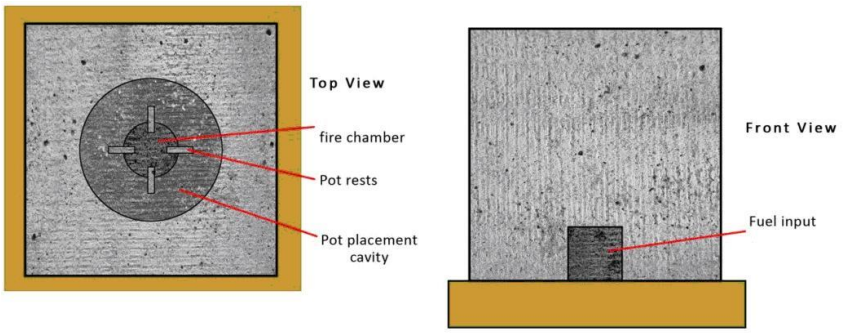


Image 1. Diagram of CZK stove

The stove consists of an inner firebox being a standardised fired-ceramic liner, made locally where possible; a grey cast iron plate that is specifically shaped for optimum efficiency; an open front ease of viewing whilst operating the fire; a secondary air intake to assist with the fire starting, maximising air flow during combustion and keeping the wood on a brick loading platform; and the outer skin of fired bricks. It is a high performance, ergonomically designed cook stove that was designed with both the builder and the user in mind.

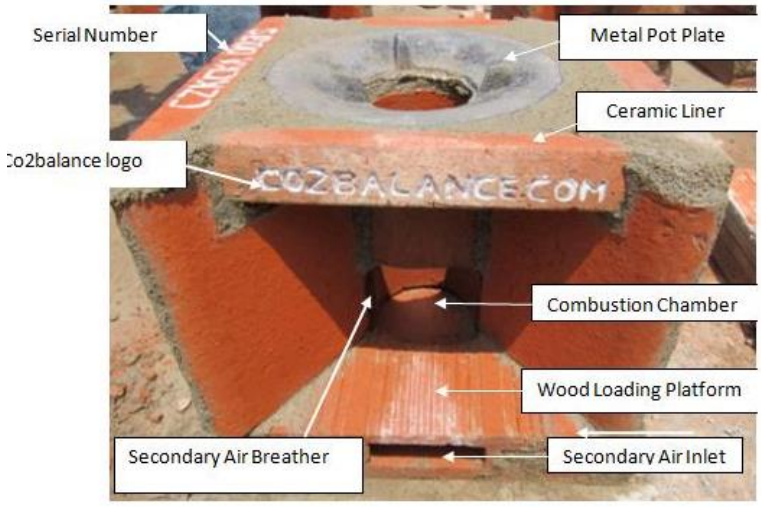


Image 2. Photo of a CZK stove

The Carbon Zero Kenya Cook-Stove (CZK)

The new stove to be distributed in the expanded Meru project boundary in 2016 is the WISDOM improved cookstove.

Its dimensions are as follows.

Diameter at top = 26cm
Diameter at base = 22cm
Diameter of wood entrance = 10cm

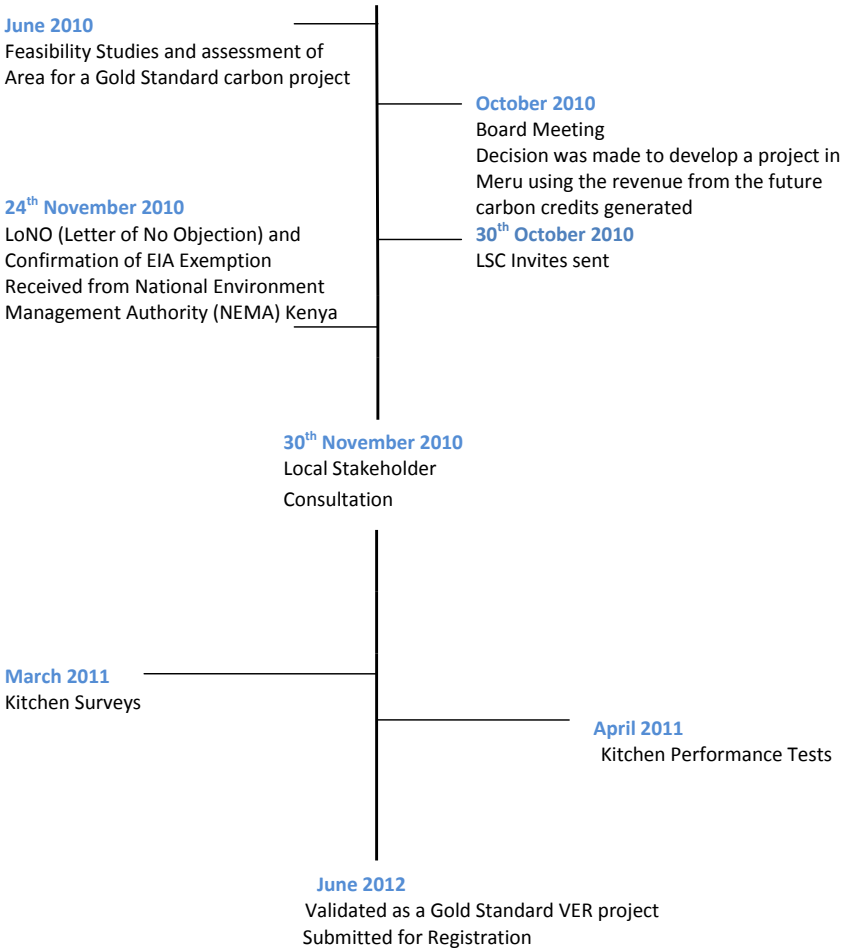
Sustainability

As well as reducing greenhouse gas emissions this project will contribute to sustainability and millennium development goals in a number of ways including:

- Reducing householders exposure to health damaging biomass smoke
- Reducing pressure on local woodland and hence biodiversity
- Improved livelihood of the poor
- Increased rate of technology transfer

A detailed discussion of the impact of the project on sustainable development can be found in the accompanying Gold Standard Passport.

Meru Project Timeline



- Project is submitted for design change in **February 2016**.

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A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private entity project participants	Kindly indicate if the Party involved wishes to be considered as a project participant (Yes/No)
Kenya (host)	N/A	No
United Kingdom	co2balance UK	No

The project is voluntary and as such official endorsement from the Parties is not required, the Kenyan DNA (NEMA) is however, aware of the project as this is the host country. NEMA were invited to the local stakeholder's meeting and also engaged to confirm the EIA non-requirement status of the project. Confirmation of the non-EIA requirement is available at validation.

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

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

A.4.1.1. Host Party(ies):

Republic of Kenya

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

The activities will take place within the Eastern Province of Kenya.

A.4.1.3. City/Town/Community etc:

The project activities will take place within the Kenyan country as follows:

Province: Eastern Province

District: Meru South District

Divisions: Chuka, Magumoni, Igambang'ombe (Total of ~~33,259~~8,000 HHS)

Counties: Nyeri, Meru, Laikipia,

Location/Sub-location breakdown as below:

Chuka Division		
		Estimated number of households
Location	**Kiang'ondu**	**4695**
Sub locations	Kiang'ondu	1024
	Mucwa	755
	Township	2916
Location	**Mugwe**	**2649**
Sub locations	Mugirirwa	1369

	Kirege	1280
Location	**Karingani**	**4820**
Sub locations	Mariani	1374
	Karongoni	1207
	Ndagani	1225
	Njaini	239
	Rukindu	775
Location	**Kithangani**	**1116**
Sub locations	Kithangani	319
	Weru	292
	Marembo	327
	Rianthiga	178
Location	**Gitareni**	**2277**
Sub locations	Gitareni	884
	Kiamucii	803
	Kaarani	590
Location	**Muiru**	**1312**
Sub locations	Muiru	771
	Nkuthika	541
Total HHS		16,869

Magumoni Division		
		Estimated number of households
Location	**Thuita**	**1688**
Sub location	Thuita	885
	Kathatwa	803
Location	**Rubate**	**1077**
Sub location	Kanthiri	415
	Rubate	662
Location	**Magumoni**	**1501**

Sub location	Nthambo	962
	Njuri	539
Location	**Mwonge**	**1619**
Sub location	Mwonge	700
	Kangoro/Karamani	546
	Kagumo	373
Location	**Kabuboni**	**1195**
Sub location	Kanyakini	482
	Kabuboni	713
Location	**Mukuuni**	**2171**
Sub location	Kinoru	648
	Karamani	1068
	Mukuuni	455
Total HHS		9,251

Igambang'ombe Division

		Estimated number of households
Location	**Kajuki**	**1928**
Sub location	Kajuki	666
	Kamutiria	677
	Makanyanga	585
Location	**Kamwimbi**	**1305**
Sub location	Kiaritha	734
	Kamwimbi	571
Location	**Mutino**	**2115**
Sub location	Kamonka	530
	Mutino	775
	Kathanje	810
Location	**Kamaindi**	**786**
Sub location	Igambang'ombe	343
	Kamaindi	443
Location	**Itugururu**	**1005**
Sub location	Igamatundu	548
	Mbogoni	457
Total HHS		7,139

The following is a list of locations where new stoves are expected to be distributed as part of this design change.

Nyeri county EEL	
wards	**sub-locations**
Naromoru/ Kiamathaga	Naromoru, Ndiriti, Kabendera, Tigithi, Murichu, Kamburaini and Gikamba
Thegu River	Maragima, Thirigitu, Thungari, Rongai, Gaturiri and Lusoi
Kabaru	Ndathi, Kirima, Kimahuri and Munyu
Gakawa	Kahurura, Gathiuru and Githima
Meru county EEL	
Ward	**sub-locations**
Timau	Kangaita, Katheri, Antu Ba Mwitu, Kithithina and Kiambogo
Kisima	mutarakwa,maritati,Buuri
Laikipia county EEL	
Ward	**sub-locations**
Thingithu	Marura, Thingithu
Nanyuki	Nturukuma,Likii
Tigithi	Lamuria, Matanya
-	-

~~*Household numbers are not estimated at the present time.~~

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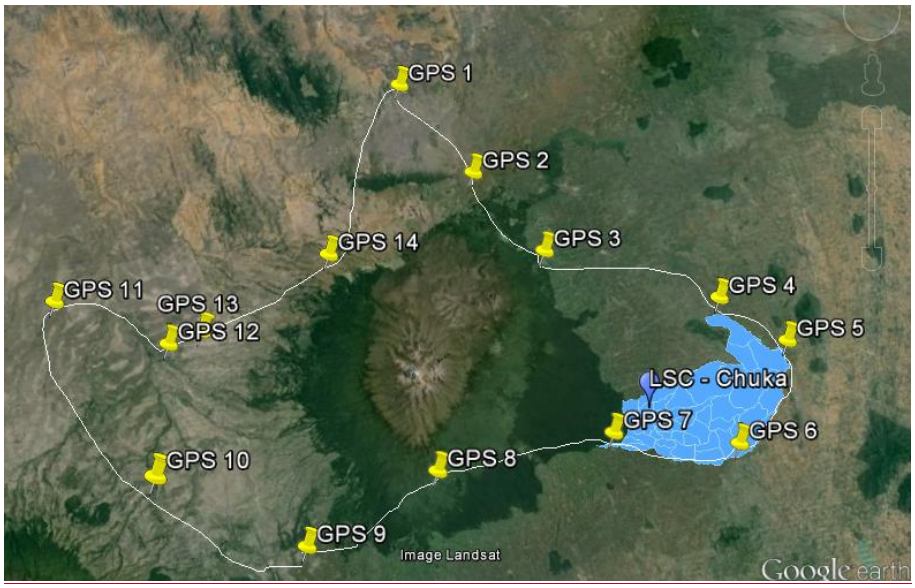
A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

GPS locator
Latitude: 0°21'42.42"S
Longitude: 37°44'31.26"E

For the purposes of this project the boundaries have been defined as the political boundary to include all sub-locations as illustrated below.

The new project boundary incorporates the Meru project boundary and the Wards in Nyeri, Meru and Laikipia counties.

145 GPS points are included which are perimeters on the project boundary. They are visible on the map below:



***Current Meru project is included in Blue**

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	Latitude	Longitude
GPS 1	0.287158°	37.422249°
GPS 2	0.104957°	37.490048°
GPS 3	-0.055406°	37.557590°
GPS 4	-0.219486°	37.803901°
GPS 5	-0.320939°	37.884773°
GPS 6	-0.448340°	37.751354°
GPS 7	-0.366347°	37.565059°
GPS 8	-0.330867°	37.280310°
GPS 9	-0.388416°	37.011156°
GPS 10	-0.198859°	36.851114°
GPS 11	0.089320°	36.779369°
GPS 12	-0.001687°	36.932887°
GPS 13	0.000787°	36.990068°
GPS 14	0.068146°	37.209082°

The outer limits of the project boundary are these 14 GPS points.

The stoves will be individually tracked using GPS co-ordinates to ensure they fall within the project boundary. Furthermore, each stove is marked with a unique identification number that will be uploaded and kept on the electronic database; this includes household occupants and GPS co-ordinates. That will allow the individual tracking of each stove to avoid double counting and boundary issues.

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

The project falls under the Energy Efficiency – Domestic type and category according to the GSV2.1 toolkit.

The project technology of the generic 'rocket stove' type is well proven to be environmentally safe and sound in relation to the baseline 'three-stone' technology. [8] The rocket stove technology will be distributed to a number of households within the project area and households trained in efficient use of the stoves to ensure successful transfer of this technology type to the area in question.

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

Year	ER - Estimation of annual emissions reductions in tonnes CO_2e	
2011	7,035	Actual amount verified MP1
2012	24,496	Actual amount verified MP1
2013	26,094	Actual amount verified MP1 and MP2
2014	31,566	Actual amount verified MP2 and predicted MP3
2015	23,849	Predicted amount MP3
2016	36,691	Estimated ex ante
2017	36,691	Estimated ex ante
2018	36,691	Estimated ex ante
Total estimated reductions (tonnes CO_2e)	223,114	
Total number of crediting years	7	
Annual average of the estimated reductions over the	31,873	

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[8] MacCarty, N., Ogle, D., Still, D., Bond, T. & Roden, C., (2008). '*A laboratory comparison of the global warming impact of five major types of biomass cooking stoves', Energy for Sustainable Development* 12 (2), pp. 5-14. Accessed from http://www.aprovecho.org/lab/pubs/rl/perf-stud/category/20

crediting period	

Year	ER - Estimation of annual emissions reductions in tonnes CO_2e
2012	65,390
2013	68,029
2014	68,029
2015	68,029
2016	68,029
2017	68,029
2018	68,029
2019	5,669
Total estimated reductions (tonnes CO_2e)	479,233
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period	68,462

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

There is no public or ODA funding for this project activity, all revenue for the project will be derived from the sales of VERs. Please see annex 1 in the passport for a copy of ODA letter as proof of this.

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

If each of the independent subsystems/measures (e.g., biogas digesters, residential solar energy systems, kerosene or incandescent lighting replacements) included in one or more CDM project activities is no greater than 1% of the small scale thresholds defined by the applied methodology and the subsystems/measures are indicated in the PDDs to be each implemented at or in multiple locations (e.g., installed at or in multiple homes) then these CDM project activities are exempted from performing a de-bundling check, i.e., considered as being not a de-bundled component of a large scale activity[9].

Refer to Excel file 'PDD Supplementary Data Meru v4 which shows that each stove, installed in multiple homes, saves less than 1% of the 180 GWh~~th~~/yr Small Scale threshold (see section B.2) which therefore means that this project is exempt from a debundling check.~~.~~

SECTION B. Application of a baseline and monitoring methodology

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

The project activity falls within the Gold Standard Methodology *'Technologies and Practices to Displace Decentralized Thermal Energy Consumption'* Version 1. This was the most up to date methodology at the time of submission.

[9] EB 54, Annex 13 Paragraph 7

Additionality is demonstrated using the UNFCCC Tool for the demonstration and assessment of additionality (Version 05.2) which shows that the project would not be possible without VER revenues.

The justification of the choice of the methodology is shown in the table below to show that it is fully applicable to the proposed project activity.

Methodology Requirement	**Project**
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	The project boundary has been clearly demarcated using political divisions recognised in Kenya. The stoves counted are individually identified by a project specific identification code that is referenced in all records relating to the stove, stored in the project proponent's database. This ensures that the stoves are not accidentally counted in other project activities by the project proponent. Kitchen Surveys will be used to eliminate the potential for double counting from other voluntary market or CDM activity within the project area.
2. Technologies have a continuous useful energy output 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). For technologies or practices that do not deliver thermal energy in the project scenario but only displace thermal energy supplied in the baseline scenario, the 150kW threshold applies to the displaced baseline technology.	As this project technology primarily delivers thermal energy (some displacement will occur as a result of improved cooking practices), the 150kW threshold does not apply to the baseline technology. A single stove only will be introduced into each kitchen counted by the proposed project activity. Using the results of the baseline study, the continuous useful energy output delivered has been estimated at 0.76kW.[10], which is well within the limit imposed by the methodology of 150kW.
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 and the definitive discontinuity of its use.	As referenced in the methodology 'the removal and continued non-use of three stone fires and other easily constructed traditional devices (the baseline technology replaced by this project activity) is in many cases unlikely and impractical to monitor[11]. However, this project will introduce a mechanism to encourage the cessation of use of baseline technology by educating local people on the health and environmental benefits of abandoning inefficient baseline technology entirely.
a) The project documentation must provide a clear description of the approach chosen and the monitoring plan must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of	Overall use of the baseline technology will be monitored in conjunction with that of the project technology, as will the emergence of any other baseline technology by targeted end users. This information will also ensure that requirement 1

[9] See Supplementary Data for further calculations

[11] http://www.cdmgoldstandard.org/fileadmin/editors/files/6_GS_technical_docs/manuals_and_methodolgies/110411_TPDDTEC_Methodology.pdf p4

the improved technology, whether the existing baseline technology is not surrendered at the time of the introduction of the improved technology, or whether a new baseline technology is acquired and put to use by targeted end users during the project crediting period.	(above) of the methodology is also met.
b)''The success of the mechanism put into place must therefore be monitored, and the approach must be adjusted if proven unsuccessful. If an old technology remains in use in parallel with the improved technology, corresponding emissions must of course be accounted for as part of the project emissions.''	Parallel baseline technology use (viz three stone fires or traditional equivalent) will be revealed during monitoring and it effect on emissions reductions be captured using the equation 6 of the methodology $Bp,y = Np,y * ((Pp,y * Up,y) + (Pb,y * (1 – Up,y))$. The uptake rate U will be determined by surveys and hence used to account for parallel baseline and project technology use.
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, If the claimants are not the project technology end users, the end users should be notified that they cannot claim for emission reductions from the project	A full explanation will be given to all household stove recipients, or end users, that co2balance have provided them with a stove for free, with just a small contribution towards installation and maintenance, on the basis that the emissions reductions will be transferred to co2balance. This will be recorded using a Carbon Rights Form, which stove owners will sign to confirm they understand and voluntarily enter the agreement in which they cannot claim emissions reductions from the project.
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 rules.	As the technology used in this project has been specifically designed to make use of baseline feedstock viz fuelwood, rather than a new biomass feedstock, this criterion is not applicable to this project. The emission reductions from this project will result from a change in quantity of fuel *consumed*, rather than change of fuel *type*.
a)Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases (as listed in section II.1) emitted by the project fuel/stove combination are estimated with adequate precision. The project fuel/stove combination may include instances in which the project stove is a baseline stove.	The fuel used in both the project and baseline scenario is the same, as such there are no additional harmful gases released in the project scenario. The stoves are only distributed in households that previously used a three stone inefficient fire, as such both the volume of greenhouse gases and volume of harmful gases are reduced in the project scenario. The stove has been proved to reduce the

	volume of harmful noxious gases by 80% on average.[12]
b) Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section II of this methodology if correlated to data on distribution and results of field tests and surveys confirming (a) actual use of the renewable fuel and usage patterns such as average fraction of non-renewable fuels used in mixed combustion or seasonal variation of fuel types, (b) GHG emissions, (c) evidence of CO levels not deteriorating (d) any further factors effecting emission reductions significantly.	The emission reduction calculation will be based on fuel wood usage measurements (Kitchen Performance Tests) conducted in the field, as per point "a" above. These will be conducted in the household in both the baseline and project scenario and performed as part of the monitoring plan. In addition the carbon zero stove has been tested in laboratory settings to ensure that it is of improved efficiency compared to the traditional three stone fire. Fuel sales will not be monitored or used in any equations in this project

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

The project will be classified as small scale in accordance with the Gold Standard rules. Small scale energy efficiency projects are defined by the Gold Standard/CDM EB as projects involving energy improvement of less than 60GWh (or an appropriate equivalent.[13]) per year. Details of these calculations are available at validation in Supplementary Data sent with this PDD (Sheet B2)

Project Type

As this project involves the replacement of traditional inefficient cooking devices with improved technology, it is classified as a type II (Energy efficiency improvement project.) A total saving of 60 GWh per year is equivalent to a maximal saving of 180 GWhth per year in fuel input14 (in this case wood)

Project Category

As this project involves the adoption of energy efficient equipment at many sites, it is classified as category II.C (Demand-side energy efficiency programmes for specific technologies)

B.3. Description of the project boundary:

T he project boundary is specified in the methodology as follows:

Methodology Specification	Project
a) The project boundary is the physical,	The project boundary is therefore defined as the

[12] See report compiled by the University of Nairobi

[13] http://unfccc.int/resource/docs/2006/cmp2/eng/10a01.pdf#page=3

[14] http://cdm.unfccc.int/EB/033/eb33_repan27.pdf

geographical sites of the project technologies and potentially of the baseline and project fuel collection and production (e.g. charcoal, plant oil), as well as solid waste and effluents disposal or treatment facilities associated with fuel processing.	domestic kitchens in which each project technology is installed.
b) The target area is defined by the regions or towns within a single country, or across multiple adjacent countries, where the considered baseline scenario(s) is(are) assessed to be uniform across political borders. The target area provides an outer limit to the project boundary in which the project has a target population.	The target area is defined by the image in A4.1.4.
c) In cases where woody biomass (including charcoal) is the baseline fuel, the fuel production and collection area is the area within which this woody biomass can reasonably be expected to be produced, collected and supplied.	The fuel production and collection area has been defined by Kitchen Surveys which show that the majority of households collect their fuel from the local area on foot.[15]

Emission sources within the project boundary

Greenhouse gasses included in the project and baseline scenarios are tabulated below.

	Source	Gas	Included?	Justification/Explanation
Baseline	Cooking, production of fuel, and transport of fuel	CO_2	Yes	Carbon dioxide is emitted during the combustion of biomass in the baseline and is one of the six greenhouse gases targeted by the IPCC [16]
		CH_4	Yes	Methane is emitted during the combustion of biomass in the baseline and is one of the six greenhouse gases targeted by the IPCC *(ibid)*
		N_2O	Yes	Nitrous Oxide is emitted during the combustion of biomass in the baseline and is one of the six greenhouse gases targeted by the IPCC

[15] See Baseline report

[16] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

				(ibid)

	Source	Gas	Included?	Justification/Explanation
Project	Cooking, production of fuel, and transport of fuel	CO_2	Yes	Carbon dioxide is emitted during the combustion of biomass in the project scenario and is one of the six greenhouse gases targeted by the IPCC *(ibid)*
		CH_4	Yes	Methane is emitted during the combustion of biomass in the project scenario and is one of the six greenhouse gases targeted by the IPCC *(ibid)*
		N_2O	Yes	Nitrous Oxide is emitted during the combustion of biomass in the project scenario and is one of the six greenhouse gases targeted by the IPCC *(ibid)*

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

A. Baseline Non-Renewable Biomass Assessment

The baseline Non renewable biomass assessment was conducted by an independent consultant C4Eco Solutions based in South Africa. Approach *described in sections A1.1 and A 1.2*- was followed (refer to attached co2balance fNRB report). All variables, data sources and parameters used to determine the baseline are listed in the report.

B. Baseline Survey

Personal interviews, or Kitchen Surveys, were carried out in February as directed by the independent consultant HED and as described in the baseline report. A representative sample size of targeted end users was interviewed to capture the following demographic, cooking preference and fuel choice variables:

- Their address and telephone number (mobile or landline where possible)
- The number of people served by the baseline technology and typical usage patterns and tasks (e.g. domestic/commercial cooking)
- The types and estimated frequency of baseline technologies used and estimated frequency
- The types of fuels used and estimated quantities
- Seasonal variations in baseline technology and fuel use

- Sources of fuels and prices paid (if purchase is the source) or effort made (if collection is the source)
- Woody biomass renewability and non renewability indicators as indicated in Annex 1 of the methodology

The information from the baseline survey was used to choose the most representative households in terms of the above stated variables for the baseline performance test. This process was carried out by an independent consultant.

C. Baseline Performance Field Test

The baseline performance field test follows the guidance in annex 4 of the methodology – the Kitchen Performance Test. The Kitchen performance test was used to measure a range of targeted end user wood use from which a statistically confident estimate of the mean was taken. An appropriate time of year to conduct the KPT to ensure a conservative result was advised by an independent consultant.

The key variables that were measured during the KPT and used in producing a confident estimate of the mean baseline wood use (in conjunction with the variables in baseline survey listed above) were:

Variable	Unit	Source
Children age 0 – 14 years	-	Household KPT Survey
Females over 14 years	-	Household KPT Survey
Males 15 – 59 years	-	Household KPT Survey
Males over 59 years	-	Household KPT Survey
Weight of wood used in 24hrs	Kg	Weight of used wood during Household KPT Survey (over 4 days)

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

There has not been a previous announcement that the project activity would go ahead without the Gold Standard. The project activity is financed upfront for future Gold Standard VERs as the only source of funding and so the project activity could not go ahead without VER revenues.

Additionality is demonstrated under EB 68 Annex 27 which shows that the project would not be possible without VER revenues.[17] ~~using the UNFCCC Tool for the demonstration and assessment of additionality (Version 05.2) which shows that the project would not be possible without VER revenues.~~

~~The proponent has chosen to follow steps 1, 3 and 4 from the tool.~~

[17] [17] Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds;

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

Sub-step 1a: define alternatives to the project activity:

Alternative 1: Stoves are designed, marketed, built and distributed by a stove builder without registering as a Gold Standard VER project.

Under this alternative scenario the project would proceed as laid out in this document. This would provide the same energy output, result in the biomass savings, improved livelihoods and other contributions to sustainable development identified. There may be some retained use of baseline stove for occasional heating purposes as identified in the baseline study.

Alternative 2: Continuation of the current situation – use of traditional cooking with 3-stone fireplaces.

Without the intervention of the project and use of carbon finance it is unlikely that the status quo will change.

Outcome of sub-step 1a: Two realistic and credible alternatives to the project activity have been identified.

Rejected Alternatives: The purpose of this section is to identify realistic and credible alternatives to the project activity that deliver a similar outcome. The following alternatives were considered but rejected for the reasons given:

- Distribution of charcoal stoves – as identified in the Kitchen Surveys while there is some use of charcoal it is not the dominant fuel type in the area. Therefore any charcoal stove project is not likely to attract high levels of usage due to lack of fuel.
- Alternative fuel supply – the supply of on-grid electricity or gas would require major infrastructure investment by the Kenyan government. No such plans have been reported and so this is not a credible alternative.
- Alternative fuel supply – off grid supply of kerosene burning stoves. As with charcoal the Kitchen Surveys identified that while some use of kerosene may be occurring the access to such fuel (cost and availability) is likely to be prohibitive.

Sub-step 1b: Consistency with mandatory laws and regulatory

In Kenya there is no law or regulation that applies to the efficiency of cooking stoves or that requires the use of efficient stoves, and none is expected to be introduced during the project hence all cook stove distribution is a voluntary action. Hence the alternatives identified in Sub-step 1a above are in compliance with the mandatory laws and regulations in Kenya.

Outcome of sub-step 1b: Two realistic and credible alternative scenarios to the project activity that are in compliance with mandatory

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legislation and regulations taking into account the enforcement in the region and EB decisions on national and/or sectoral policies and regulations have been identified.

Step 3: Barrier Analysis

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

(a) Investment barriers

Government funding

This is discussed in step 4 below.

Private funding

Significant up-front investment has been required to research, test and develop an appropriate stove for the rural Kenyan situation. A study by the World Bank found that 53% of small business in Kenya identified access to finance as a major business constraint, ranking this as the second largest obstacle, 83% of small businesses rely on internal funding/returns for investment.[18] Given this, it is unlikely that a source of funding could be found for a start-up business as proposed.

The proposed project activity is being developed by co2balance UK Ltd, a private business established in 2003 in the carbon offset industry. Carbon Zero Kenya Ltd, a separate organisation, will manage the implementation of the project activity.

Co2balance UK Ltd has a number of offices and permanent employees, established with funding obtained from retail sales of carbon, shareholders and private investors. The business model (and all investment made) is based around the existence of carbon revenues as a source of income, without which projects would be cash negative as the stoves are exchanged for a householders legal ownership of the CO_2e emissions reductions. This level of investment made would unlikely be made in a single Kenyan SME with the same business model.

As for obtaining private investment in such a business, studies, reports, and surveys show that the political and economic environment in Kenya is not ideal for foreign investment. Kenya currently has a credit rating of 'B', which is five levels below investment grade.[19] The credit rating was downgraded after the post-election violence in 2007/2008.

The poor credit rating embodies aspects of political instability and wide-spread corruption. In 2009, The World Bank Institute published

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[18] http://www.enterprisesurveys.org/CustomQuery/Country.aspx?economyid=101&year=2007&characteristic=size

[19] Kenya's Credit Rating Outlook Raised to 'Stable' by S&P 2008, March 10th). *Bloomberg*, Retrieved from www.bloomberg.com/apps/news?pid=20601116&sid=aGLaHAcFh8sQ&refer=africa

governance ratings for Kenya. The report covers such aspects as political stability, corruption, rule of law, and government effectiveness from 1996 to 2008. The rating is displayed as a percentile and interpreted as the percentage of countries that rank below the one in question. Concerning "Political Stability and Absence of Violence" in Kenya in 2008, the report stated, with 90 per cent confidence, that 80 per cent of countries are more stable and less violent then Kenya. Additionally, 70 per cent of countries were shown to perform better than Kenya in "Control of Corruption" in 2008 with 90 per cent confidence.[20]

Finally, a study by the World Bank found that 53% of small business in Kenya identified access to finance as a major business constraint, ranking this as the second largest obstacle, 83% of small businesses rely on internal funding/returns for investment.[21] The up-front costs required to develop market efficient cook stoves are significant, and until a reduction in costs could be proven, there would be no market. Given this financial case, for such a business it is unlikely that a source of funding could be found.

In summary, there is no or insufficient private capital due to the actual or perceived risk of conducting business in the host country, Kenya.

(b) Technological barriers *Inter alia*

Although the *generic* 'rocket stove' technology is not new, significant funding has been required to overcome the numerous technological barriers to implementation of the specific technology. Investment is required in: researching, developing and testing the design; financing construction materials; transportation of materials; education programme, amongst other things. Although there is existing ceramic manufacturing capacity within the country, financing is required for specific components that have been developed for the project. The specific technology to be utilised would not have been developed without the anticipated carbon finance. Maintenance of product quality is also an important factor to consider, especially in light of the successful Kenya Ceramic Jiko (KCJ) which is independently produced and marketed for charcoal consuming urban dwellers. It has been found that although widely disseminated, the product efficiency and durability has dwindled due to a lack of enforced standards and cost-cutting measures to remain in the market.[22]

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[20] Governance Matters 2009: Country Data Report for Kenya, 1998-2008 (2009, June). *World Bank Institute*. http://info.worldbank.org/governance/wgi/pdf/c116.pdf

[21] http://www.enterprisesurveys.org/CustomQuery/Country.aspx?economyid=101&year=2007&characteristic=size

[22] Pg. 56"Study on Kenya's energy demand, supply and policy strategy for households, small scale industries and service establishments", Republic of Kenya Ministry of Energy, Sept 2002.

- Despite the presence of improved cook stoves in Kenya for 30 years**Error! Bookmark not defined.**, the use of improved wood stoves in rural Kenya is not widespread (estimated at 4% penetration[23]), with householders typically using inefficient three stone fires due to a number of technological and financial barriers.[24,1] Clearly marketing and education is required to encourage the uptake and continued use of improved stoves, this is a challenge in the rural communities of the proposed activities.

- Skilled labour: In addition there is a lack of an adequately trained local workforce capable of constructing and maintaining stoves at present, specific training in construction is required for the technology to be utilised. There is no clear development of a market that would drive such capacity to be built due to the financial barriers stated above.

- **(c) Barriers due to prevailing practice *inter alia***

- Habitual use of traditional stoves imposes a very strong influence on the baseline scenario, resulting in continuation of use of traditional three stone fires. There have been some efforts to introduce improved cook-stoves in Kenya however success has been limited mainly to urban-dwelling charcoal users.

- Although significant efforts have been made to produce an improved stove that is similar in use to three stone cooking, there remain some differences in the way a user must approach cooking. Without community-based staff to provide education and guidance on stove use it is unlikely that widespread adoption would occur.

- **Outcome of sub-step 3a:**

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Barrier	**Prevents seen**	**Prevents seen**

[23] Pg. 55"Study on Kenya's energy demand, supply and policy strategy for households, small scale industries and service establishments", Republic of Kenya Ministry of Energy, Sept 2002.

[24] http://www.hedon.info/RocketMudStovesInKenya

~~barrier~~	~~barrier~~	~~barrier~~
~~Investment private funding~~	~~Yes – not available~~	~~No~~
~~Technological development~~	~~Yes – funding required~~	~~No~~
~~T~~	~~Y~~	~~N~~

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~~technological - QA~~	~~yes – constistent funding required~~	~~no~~
~~Technological - training~~	~~Yes – funding req~~	~~No~~

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	~~required~~	
~~Prevailing practice – education~~	~~Yes – funding required~~	~~No~~

~~Clear barriers such as poor access to finance, low attractiveness of Kenya for external investment, lack of high quality technology, and low education about the improved technology offered have been identified that may prevent the implementation of alternative scenario 1.~~

~~***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)***~~

~~None of the identified barriers discussed above prevent alternative 2, continuation of cooking on three stone fires, from occurring.~~

~~***"If both Sub-steps 3a – 3b are satisfied, proceed to Step 4 (Common practice analysis)".***~~

~~**Step4: Common practice analysis**~~

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

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The Common Practice Analysis is considered for the country of Kenya, the national boundaries of Kenya define the geographical scope. Improved cook stoves started to appear in Kenya in 1981 following the UN 'Conference on New and Renewable Sources of Energy'. This section considers technology comparable to that provided in the Project Scenario e.g. domestic scale improved cook stoves delivering approximate useful outputs of less than 1Kw (where possible to measure).

Upesi Stoves

The Upesi project started in 1995, it was supported by Intermediate Technology Development Group (ITDG) the aim was to commercialise the Upesi stove in Western Kenya. This stove had been developed in collaboration with GTZ 9 years previously: Potters were trained in the production of the liner and it was distributed by Ministry of Agriculture employees, price (~120KES) and distribution were subsidised by GTZ in order to make distribution viable in rural areas. After 8 years the support was withdrawn and so the project did not continue on any significant scale[25]

The stove is a simple fired clay liner (see image) which can be either used on its own or built into the ground to improve efficiency and durability. Original testing* showed up to 43% wood savings and an expected life of around 4 years.

Upesi liner[24]

After 5 years the Upesi project had trained a number of people in marketing as well as production of the liner, it was estimated that 16,000 had been distributed.

The Rural Stoves West Kenya (RSWK) project (building the mandeleo/upesi/jiko Kisasa stoves[26]), was a project working with the Ministry of Agriculture through the Home Economics Officers, the

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[25] http://www.hedon.info/BP56_TheUpesiRuralStovesProject

[26] Rural Stoves West Kenya: http://practicalaction.org/?id=t4sl_casestudy_stoves

interest being that through the reduced pressure on non-renewable biomass - rate of deforestation was reduced which was of interest to the Ministry of Agriculture. When funding (1990 - 1995) from the Ministry of Agriculture dropped off, the level of production decreased as the subsidies, in the form of free transport for the stoves and controlled prices were removed and the poorer purchasers were unable to afford higher prices.

Built-in Upesi/Mandeleo stove[27]

Similar observations have been made regarding the Kuni Mbili, promoted by KENGO, the wood fuel version of the KCJ which is subsidised and often sold at cost or less than cost[28]. This is currently considered acceptable as the stove is still in demonstration, but when subsidies are removed the success of the Kuni Mbili commercialisation is in question. There are only 20,000 of these stoves in operation in Kenya at present.[27]

[27] Taken from http://www.pisces.or.ke/pubs/pdfs/PISCES_Kenya_Report_2010.pdf

[28] Kuni Mbili http://www.hedon.info/BP30_CookingStovesForCommercialSustainableProductionAndDisseminationInAfrica?bl=y

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Kuni Mbili[29]

The Kenyan Ceramic Jiko was first pioneered two decades ago and has broken into the urban market, however over this time stove quality has deteriorated as price competition has led producers to cut costs in response to competition[30]. Improved Kenyan stoves tested in the 1980s consumed 30-50% less charcoal than conventional ones, today this is 24%. Consumers are not necessarily aware of drop in efficiency but a notice the decline in appearance and robustness.

The Private Sector Development in Agriculture (PDSA) stove project was carried out by GTZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). The objective of this project was to distribute ~180,000 ICS by 12/2008 within rural and urban households in a number of districts of Kenya, including Kisumu. The project focussed on commercialising a number of stove technologies, dometic ICS were; the existing Jiko Kisasa (formally mandeleo/upesi) liner, Jiko Kisasa built in & a new model, the rocket mud stoves.

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[29] Taken from http://www.bioenergylists.org/stovesdoc/Ezzati/Home%20Page%20of%20Majid%20Ezzati.htm
[30] DFID http://povertystoves.energyprojects.net/

Two pot rocket stove[31]

It is reported[32] that by Dec 2007, 24 individuals were involved in the production of fixed Jiko Kisasa stoves and 220 trained in constructing rocket stoves.

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

A recent assessment of the PDSA project[32] showed that no poor households had the more expensive rocket stove (similar quality to the proposed activities technology) and that low income households such as those targeted by the proposed activity had only 16% of ICS despite making up half the population. It was also found that the lowest number of households utilising ICS was in the area where the proposed activity will be developed.[33] Surveying showed that the main reasons for people not owning an ICS (in order of responses) were cost, no interest & don't know where to buy them[34]. Clearly the proposed activity addresses these issues.

Although a number of improved cook stove dissemination activities have been observed in Kenya, all have been subsidised by external funding and have not lead to widespread common use of improved cook stoves in rural Kenya use of improved wood stoves in rural Kenya is estimated at

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[31] Taken from http://www.gtz.de/de/dokumente/en-kenya-results-assessment-stoves-2009.pdf

[32] Pg 35 http://www.gtz.de/de/dokumente/en-kenya-results-assessment-stoves-2009.pdf

[33] Pg 36 http://www.gtz.de/de/dokumente/en-kenya-results-assessment-stoves-2009.pdf

[34] Pg 52 http://www.gtz.de/de/dokumente/en-kenya-results-assessment-stoves-2009.pdf

4% penetration[35]. The repeated efforts at commercialisation suggest that they have not been successful despite subsidising stoves. The distinction between these and the proposed activity is that stoves are given in exchange only for legal entitlement to the CO_2e rights, and in the poorest rural communities, thus reaching those unlikely even to buy a subsidised stove. On top of this the stove quality will be higher due to the use of centralised production of the key components (pot rests and ceramic liner) and more stringent QA procedures that can be put in place with a project building many stoves in a short period and a small geographical area. In this sense it is anticipated that product quality differentiates the proposed project from others.

It is therefore concluded that the project is additional.

B.6.1. Explanation of methodological choices:

Application of methodological procedures:
The project proponent has opted to carry out a single sample test of baseline fuel use and use an independently verified assessment of the thermal efficiency of the improved project stove in estimating the project scenario and hence emission reductions. The procedures used are described below:

Procedures used to calculate baseline emissions:
The non renewable biomass fraction was calculated according to substep A1.3 provided by the methodology (that similar to that of CDM AMS II G). This study was carried out by an independent consultant. A baseline survey was used to assess target population characteristics of randomly selected households using traditional 3 stone fires. Of those interviewed, the most representative end users (by demographic indicators and cooking preferences) was selected for the baseline KPT study using statistical analysis by an independent consultant for transparency.

The standard approach to a Kitchen Performance Test listed in the methodology was followed and KPTs were conducted during the rainy season on the advice of an independent consultant to ensure a conservative result. The results of the KPT were then statistically analysed according to the 90/10 rule to determine a representative figure for baseline emissions, unfortunately the co efficient of variance for a sample size of 43 was too small therefore the lower bound of confidence of 90% was used.

Procedures used to calculate the project emissions:
An independent laboratory test of the thermal efficiency of the project technology was used to estimate the project fuel use in relation to the baseline technology. A default efficiency of 10% of the baseline technology was applied in accordance with the rules of the methodology. Measured baseline fuel use from the statistically representative KPT studies (shown in the prior section) was used to predict savings as a result of the improvement in efficiency of the project technology. These calculations were carried out by an independent consultant and are made available for validation.

[35] Pg. 55"Study on Kenya's energy demand, supply and policy strategy for households, small scale industries and service establishments", Republic of Kenya Ministry of Energy, Sept 2002.

The proponent will carry out KPTs for the project scenario in time for verification; project tests will be independent of the baseline tests. This option allows a proper development of the project and hence accurate assessment of emissions reductions - this process is fully described in the monitoring plan.

Procedures used to calculate leakage:

The potential sources of leakage listed in the methodology are investigated, and addressed below:

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.

In all cases the traditional stoves replaced are three rocks; these have no market value and are not a product as such. There is nothing limiting the use of three stone cooking across the country (technology is lowest, price is zero), which is why this cooking method is so widespread. This leakage source can therefore be discounted.

b) The non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.

There is no evidence to suggest significant (if any) use of renewable energy for cooking in the project region as found in the Kitchen Surveys. As solar ovens are not available, renewable energy use for cooking would likely be use of animal dung or crop residues which will be used due to ease of availability/proximity to the home rather than due to a shortage of wood fuel, therefore being an independent factor. This leakage source can therefore be discounted.

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.

The NRB fraction will be periodically monitored. However as the majority of participants collect wood from within the project boundary, it is not expected that the NRB in other areas will be affected. There are currently no other CDM or VER projects in the project area.

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.

This is possible in some areas covered by the project, any compensation will however be covered in the results of the monitoring KPT (which encompasses all wood-fuel use) and the monitoring KS (which will pick up on any use of other fuels for space heating) and so this need not be *separately assessed.*

e) By virtue of promotion and marketing of new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.

All stove recipients cook on 3 stone fires, in which case the only scenario producing this leakage would be a recipient reducing use of renewable fuels such as crop residues. This will be captured through monitoring KS and KPTs.

Equations used in estimated emissions reductions:

Emissions for baseline scenario are calculated using the equation below.

$$BE_{b,y} = B_{b,y} * \left(\left(fNRB_y * EF_{b,fuel,co2} \right) + EF_{b,fuel,nonco2} \right) * NCV_{b,fuel} \quad \textbf{(equation 3)}$$

The emissions reductions are equal to the baseline wooduse per year multiplied by the relevant emissions factors for burning wood and the net calorific value of wood. The non-renewable biomass fraction is taken into account. Baseline woodfuel consumption is given by:

$$B_{b,y} = N_{p,y} * \boldsymbol{P_{p,y}} \quad \textbf{(equation 4)}$$

Project Emissions

The emissions in the project scenario are calculated using an equivalent equation to equation 3. However, the project wood consumption is substituted for the baseline wood consumption. The emissions in the project scenario are give by:

$$PE_{p,y} = B_{p,y} * \left(\left(fNRB_y * EF_{p,fuel,co2} \right) + EF_{p,fuel,nonco2} \right) * NCV_{p,fuel} \quad \textbf{(equation 5)}$$

The project woodfuel consumption is given by equation 6. The woodfuel consumption in the project scenario takes into account the usage percentage of the project technology.

$$B_{p,y} = N_{p,y} * ((P_{p,y} * U_{p,y}) + (P_{b,y} * (1 - U_{p,y})) \quad \textbf{(equation 6)}$$

The project wood use is calculated using the lab-tested stove efficiencies, according to:

$$P_{p,y} = B_{b,y} * (\eta Baseline / \eta Project) \quad \textbf{(equation 7)}$$

Where η is the thermal efficiency of the device in either scenario (using equation 3 derived from AMS II.G, option 2).[36]

Overall Emissions

The total emissions reductions for year y is equal to the sum of the baseline emissions minus the project emissions minus any leakage that needs to be taken into account.

$$ER_y = \Sigma BE_{b,y} - \Sigma PE_{p,y} - \Sigma LE_{p,y} \quad \textbf{(equation 8)}$$

[36] http://cdm.unfccc.int/methodologies/DB/6U8JYO9XTLVZ8LJ7GUBSZP145BIDG2/view.html

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

Data / Parameter:	$EF_{b,CO2}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of wood-fuel in baseline scenario (includes production, transport and use)
Source of data used:	Calculated from IPCC defaults
Value applied:	112 – see GS Methodology (TPDDTEC Page 15)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	$EF_{b,CH4}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of wood-fuel in baseline scenario (includes production, transport and use)
Source of data used:	Calculated from IPCC defaults
Value applied:	0.63
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	$EF_{b,N2O}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of wood-fuel in baseline scenario (includes production, transport and use)
Source of data used:	Calculated from IPCC defaults
Value applied:	1.24
Justification of the choice of data or description of measurement methods and procedures actually	Deemed valid by methodology.

applied :	
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	$EF_{p,CO2}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of wood-fuel in Project scenario (includes production, transport and use)
Source of data used:	Calculated from IPCC defaults
Value applied:	112
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	$EF_{p,CH4}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of wood-fuel in Project scenario (includes production, transport and use)
Source of data used:	Calculated from IPCC defaults
Value applied:	0.63
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	$EF_{p,N2O}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of wood-fuel in Project scenario (includes production, transport and use)
Source of data used:	Calculated from IPCC defaults
Value applied:	1.24
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	NCV_b

Data unit:	TJ/ton
Description:	Net calorific value of the fuels used in the baseline
Source of data used:	IPCC defaults
Value applied:	0.0156
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5for further details

Data / Parameter:	NCVp
Data unit:	TJ/ton
Description:	Net calorific value of the fuels used in the baseline
Source of data used:	IPCC defaults
Value applied:	0.0156
Justification of the choice of data or description of measurement methods and procedures actually applied :	Deemed valid by methodology.
Any comment:	See Supplementary Data Meru Version 5 for further details

Data / Parameter:	fNRB
Data unit:	Fractional non-renewability
Description:	Non-renewability status of woody biomass fuel in scenario i during year y
Source of data used:	Independent study (C4Ecosolutions)
Value applied:	0.97
Justification of the choice of data or description of measurement methods and procedures actually applied :	Approach A1.1 Quantitative NRB assessment was used in accordance with the methodology
Any comment:	Also included in Monitoring – biennial update as per methodology.

B.6.3 Ex-ante calculation of emission reductions:

>> All the calculations performed in this section are further developed and available in the supplementary excel info sheet sent with this document.
Equations 3,4,5,6,& 7 were applied as shown in B6.

As discussed in section B.6 and the attached report, the results of the KPT were analysed to provide the average fuel saving per stove per year to the lower bound of 90% confidence interval. This was then used to calculate the ex-ante emissions reductions per stove-year.

	kg/HH/day
Average	**12.1kg**
Saving Adj for lower bound of 90% confidence	**10.80**

The value was input into equation 4 section B.6.1.

Baseline Fuel Consumption			
Project Technology Days	N(p,y)	2,915,255 ~~5,405,195~~	technology -days
Specific Fuel consumption for an individual technology in baseline scenario b during year y	P(b,y)	0.01	t/day
Quantity of fuel consumed in baseline scenario	B(b,y)	31,485 ~~58,376~~	t/year

B(b,y) was then input into equation 3 section B.6.1 to calculate the emissions in the baseline scenario for the project area.

Baseline Emissions			
Quantity of fuel consumed in baseline scenario b during year y	B (b,y)	58,376~~58,376~~	t
Fraction of non-renewable biomass	fNRB	0.97	
Emissions Factor CO2 for woodfuel	EF(b,fuel,CO2)	112	tCO2/TJ
Emissions Factor CH4 for woodfuel	EF(b,fuel,CH4)	0.63	tCO2/TJ
Emissions Factor N2Ofor woodfuel	EF(b,fuel,N2O)	1.24	tCO2/TJ
Net calorific value of fuel reduced	NCV (b, fuel)	0.0156	TJ/t
Emissions for baseline scenario	BE(b,y)	54,278 ~~100,638~~	tCO2

Equation 5 section B.6.1 was used to calculate the emissions for the project scenario.

Project Emissions			
Quantity of fuel consumed in project scenario p during year y	B(p,y)	10,201	t
Fraction of non-renewable biomass	fNRB	0.97	-
Emissions Factor CO2 for woodfuel	EF(p,fuel,CO2)	112	tCO2/TJ
Emissions Factor CH4 for woodfuel	EF(p,fuel,CH4)	0.63	tCO2/TJ
Emissions Factor N2Ofor woodfuel	EF(p,fuel,N2O)	1.24	tCO2/TJ
Net calorific value of fuel reduced	NCV (p, fuel)	0.0156	TJ/t
Emissions for project scenario	PE(p,y)	17,587	tCO2

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~~Project Emissions~~			
~~Quantity of fuel consumed in project scenario p during year y~~	~~B(p,y)~~	~~18,915~~	~~t~~
~~Fraction of non-renewable biomass~~	~~fNRB~~	~~0.97~~	~~-~~
~~Emissions Factor CO2 for woodfuel~~	~~EF(p,fuel,CO2)~~	~~112~~	~~tCO2/TJ~~
~~Emissions Factor CH4 for woodfuel~~	~~EF(p,fuel,CH4)~~	~~0.63~~	~~tCO2/TJ~~
~~Emissions Factor N2Ofor woodfuel~~	~~EF(p,fuel,N2O)~~	~~1.24~~	~~tCO2/TJ~~
~~Net calorific value of fuel reduced~~	~~NCV (p, fuel)~~	~~0.0156~~	~~TJ/t~~
~~Emissions for project scenario~~	~~PE(p,y)~~	~~32,608~~	~~tCO2~~

Where B(p,y) is calculated using equation 6.

Project Fuel Consumption			
Project Technology Days	N(p,y)	2,915,255	technology-days
Fuel consumption for project technology	P(p,y)	0.003115	t/day
Specific Fuel consumption for an individual technology in baseline scenario b during year y	P(b,y)	0.01	t/day
Cumulative usage	U(p,y)	0.95	estimated
Quantity of fuel consumed in project scenario p during year y	B(p,y)	10,201	t/yr

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~~Project Fuel Consumption~~			
~~Project Technology Days~~	~~N(p,y)~~	~~5,405,195~~	~~technology-days~~
~~Fuel consumption for project technology~~	~~P(p,y)~~	~~0.003115~~	~~t/day~~

Specific Fuel consumption for an individual technology in baseline scenario b during year y	P(b,y)	0.01	t/day
Cumulative usage	U(p,y)	0.95	-
Quantity of fuel consumed in project scenario p during year y	B(p,y)	18,915	t/yr

Where specific fuel consumption is calculated using equation 7.

The total emissions reduction are calculated using equation 8.

Emissions Reductions			
Emissions for baseline scenario	BE(b,y)	54,278	tCO2/year
Emissions for project scenario	PE(p,y)	17,587	tCO2/year
Leakage for project scenario	LE(p,y)	0	tCO2/year
Emissions reduction for total project activity	ER(y)	36,691	tCO2/year

Emissions Reductions			
Emissions for baseline scenario	BE(b,y)	100,638	tCO2/year
Emissions for project scenario	PE(p,y)	32,608	tCO2/year
Leakage for project scenario	LE(p,y)	0	tCO2/year
Emissions reduction for total project activ	ER(y)	68,030	tCO2/year

Emissions reduction per stove	ER(hh,y)	4.593902	tCO2/year/HH

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

Year	PE - Estimation of project activity emissions (tCO_2e)	BE - Estimation of baseline emissions (tCO_2e)	LE - Estimation of leakage (tCO_2e)	ER - Estimation of overall emission reductions (tCO_2e)
2012	29,588	91,316	0	65,390
2013	32,277	99,618	0	67,340
2014	32,277	99,618	0	67,340
2015	32,277	99,618	0	67,340
2016	32,277	99,618	0	67,340
2017	32,277	99,618	0	67,340
2018	32,277	99,618	0	67,340
2019	2,690	8,301	0	5,612
Total (tCO_2e)	225,942	697,325	**0**	**475,042**

Year	PE - Estimation of project activity emissions (tCO_2e)	BE - Estimation of baseline emissions (tCO_2e)	LE - Estimation of leakage (tCO_2e)	ER - Estimation of overall emission reductions (tCO_2e)
2012	17,587	54,278	0	36,691
2013	17,587	54,278	0	36,691
2014	17,587	54,278	0	36,691
2015	17,587	54,278	0	36,691
2016	17,587	54,278	0	36,691
2017	17,587	54,278	0	36,691
2018	17,587	54,278	0	36,691
2019	17,587	54,278	0	36,691
Total (tCO_2e)	140,695	434,227	**0**	**293,529**

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	fNRBi,y
Data unit:	Fractional non-renewability
Description:	Non-renewability status of woody biomass fuel in scenario i during year y
Source of data used:	Independent study (C4Ecosolutions)
Value applied:	0.97
Justification of the choice of data or description of measurement methods and procedures actually applied :	Approach A1.1 Quantitative NRB assessment was used in accordance with the methodology
Any comment:	Biennial update as per methodology.

Data / Parameter:	$P_{p,y}$
Data unit:	kg/household-day
Description:	Quantity of fuel that is consumed in project scenario p during year y
Source of data to be used:	Project FT, Project FT updates, and any applicable adjustment factors
Value of data	3.12
Description of measurement methods and procedures to be applied, inc. frequency:	Project FT Updated minimum every two years. The FT will utilise digital weighing scales accurate to 2dp. The scales are calibrated prior to each use by measuring against a known weight.

QA/QC procedures to be applied:	- FT will be carried out by staff trained by co2balance to meet the specific requirements of the methodology. All data presented in excel is subject to checking and cross referencing of a sample of the raw data by co2balance UK Ltd
Any comment:	Thermal efficiency of device was used to calculate an estimate of P p,y

Data / Parameter:	$N_{p,y}$
Data unit:	Project technologies credited (units)
Description:	Technologies in the project database for project scenario p through year y
Source of data to be used:	Total sales record
Value of data	Continuous
Description of measurement methods and procedures to be applied, inc. frequency:	Project technologies days will be monitored continuously using an electronic database derived from the sales record
QA/QC procedures to be applied:	Quality of data uploaded will be assured by computer using unique IDs to ensure no duplication of records resulting from human error
Any comment:	-

Data / Parameter:	U p,y
Data unit:	Fraction
Description:	Usage rate for project scenario P in year y that accounts for uptake and drop off rate of the project technology
Source of data used:	Conservative estimate
Value applied:	0.95
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurement will be supplied in time for first verification, conservative estimate used for validation. Surveys will be conducted annually inline with the methodology.
Any comment:	The operational lifetime of the stove is seven years minimum, based on the fact that a maintenance and refurbishment programme will be conducted throughout the crediting period. Drop off rate a Usage surveys will provide actual data in time for first verification

Data / Parameter:	$LE_{p,y}$
Data unit:	t_CO2e per year
Description:	Leakage in project scenario p during year y
Source of data to be used:	Baseline and monitoring surveys
Value of data	0
Description of measurement methods and procedures to be applied, inc. frequency:	Kitchen Surveys supported by desk-based research.
QA/QC procedures to	Kitchen Surveys are used and will be carried out by trained staff.

be applied:	
Any comment:	Value stated is to be applied in year one only, no further leakage is anticipated, however this will be reviewed biennially. Value multiplied by number of stoves installed.

B.7.2 Description of the monitoring plan:

A. Installation record
A comprehensive installation record will record the following information in electronic and paper format; the original documentation will be stored in Cc~~a~~rbonZ~~z~~ero Kenya office. Paper records will be filled out by stove builder; co2balance will supervise and assist stove contractors in generating the appropriate records during the construction phase of the project. (See Annex 4 for further details)

- the date of installation
- GPS location of the installed stove (not on paper)
- The date of the installation of the stove will be used to incorporate a one day's lead in time before usage is assumed of the stove to begin. This will ensure a conservative assessment of project technology days and hence overall emission reductions.
- The model of the stove The total number of stoves installed
- Address and telephone number of all stove end users
- Whether the stove will be used for commercial or domestic purposes

B. Project Database
The project database will consist of the Installation record divided according to new project scenarios as and when they occur. The project proponent expects that any improvements to the current design will not involve significant changes in combustion technology or changes in thermal efficiency of +/- 5% and hence will not entail a new project scenario. Any such changes to the current design will however be recorded in the project database. The useful life of the stove technology is estimated to be at least 7 seven years and therefore extends the crediting period chosen of 7 seven years. (See Annex 4 for further details).

All data collected in relation to the project will be held in local office and/or on the Project Database for the entire life cycle of the project and a period of 2 years afterwards. The project is 7 year renewable hence the data will be held for a minimum of 30 years (7 years, twice renewable plus 2 years). The data may be archived during the project in order to maintain clarity and security. In such instances all data shall be accurately labelled and clear notes left within the Project Database on how to access will be provided.

C. Ongoing Monitoring

Usage Survey – an annual usage survey determine the drop off rate of the project technology with the assumption that end users fall back to using the baseline technology as indicated in the methodology. As all stoves will be installed within 0.5 years of the start of the crediting period and are expected to last the lifetime of the project, minimum samples of 30 for different aged technologies will not be necessary. Therefore the annual usage survey will be conducted using a minimum sample size of 100.

The usage survey will be conducted by or under the supervision of co2balance with guidance on the sampling strategy supplied by co2balance UK Ltd. Paper and electronic copies of the surveys will be retained. (See Annex 4 for further details)

Project KPT (FT) Update

Although the stove remains materially the same each year, an age test will not be applied to the initial project KPT as the project proponent believes this will maintain a more realistic assessment of the project scenario (and also contribute to a conservative result) -. Updated project KPTs will be completed biannually and will be conducted in the same manner (i.e. to capture seasonal variations) as the original project KPTs. The project KPT update will be carried out or supervised by the co2balance monitoring team with guidance on the sampling strategy supplied by co2balance UK Ltd. Paper and electronic copies of the surveys will be retained. (See Annex 4 for further details)

Baseline KPT (FT) Update

A fixed baseline will be adopted by the project proponent following a more seasonally representative baseline KPT conducted during the first year's monitoring period. The KPTs performed during the first year's monitoring period will be carried out or supervised by the co2balance monitoring team with guidance on the sampling strategy supplied by co2balance UK Ltd. (See Annex 4 for further details)

Leakage Assessment

The potential for leakage from other sources (e.g. the rebound effect – end users responding to potential reduced expenditure under the project scenario adopt more GHG intensive fuels to supply thermal energy) will be captured by the usage survey completed annually. These surveys will be carried out or supervised by co2balance with guidance from co2balance UK Ltd. (See Annex 4 for further details)

Non-renewable Biomass Assessment update

Under the rules of the methodology, the NRB assessment will remain fixed for the entire crediting period, although the project proponent may choose to update the assessment at a later date.

Project preparation and monitoring schedule	Prior to validation	Prior to first verification[63]	Annual: after first verification	Every two years: after first verification
ER estimation for PDD	✓			
Baseline studies				
NRB assessment	✓			
Baseline survey	✓			
Baseline FT (except where default applied)		✓		
Project studies				
Preliminary estimation – ER, NRB, etc.	✓			
Project survey		✓		
Project FT		✓		
Ongoing monitoring tasks				
Maintenance of total sales record and project database	Continuous			
Usage survey			✓	
Monitoring survey			✓	
FT updates				✓
Leakage assessment				✓
Updating NRB assessments	As proposed by project proponent			

Summary Table of Field Tests and Timing

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

The application of the methodology to the project activity to report the baseline was completed on the 20/05/2011. The baseline was updated on the 26/7/2011 and adjusted to the lower bound of 90% confidence to reflect the new methodology update.

The application was carried out by co2balance UK Ltd. (the project proponent), with support from HED.

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SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The initial investment commitment for project construction was made in January 2011 for the construction of 146 stoves. The schedule of this construction (as per section B.4) was 146 pilot stoves March 2011 and then the rest of stoves (non-pilot stoves) will be built throughout 2011/early 2012. Evidence has been provided to the DoE for this commitment as shown in the constructor agreement, the starting date of the project activity is therefore January 2011 as it is the investment commitment date.

In accordance with the Gold Standard Requirements[37], section V, requirements V.a.2.1 & V.a.2.4, the starting date of the crediting period has been set to 01/02/2012 as the rest of stoves (non-pilot stoves) are to be constructed soon after this.

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

The operational lifespan of the improved stoves is expected to be a minimum of 7 years, as during the project crediting period co2balance will carry out maintenance - and refurbishment if necessary - to ensure that all stoves remain operational throughout the seven year crediting period. If the crediting period is renewed in future, the same process will be adopted.

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

The project will use a 7 year renewable crediting period.

C.2.1. Renewable crediting period

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

01/02/2012

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not Applicable.

C.2.2.2. Length:

Not Applicable.

SECTION D. Environmental impacts

>>

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

[37] Version 2.1 effective June 2009

of the project activity:

The Designated National Authority of the host party has provided confirmation that the project does not require an Environmental Impact Assessment to be carried out. Please see letter provided together with this document.

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

Not Applicable.

SECTION E. Stakeholders' comments

>>

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

The co-operation and understanding of local stakeholders is a key to the success for the project activity, with this in mind a face to face stakeholder meeting was at the.

Local stakeholders were identified by local women's groups and church groups who invited stakeholders by word of mouth, relevant NGOs and the Gold Standard were invited by email and a public invitation was placed in The Daily Nation Newspaper. All stakeholders receiving a personal invitation were provided with a brief summary of the project as well.

When inviting organisations and individuals to attend the stakeholder meeting, best efforts were made to expand the selection in order to avoid missing out any organisations or individuals that could have a key interest in the activity. A small group of diverse participants were chosen by their location, need, how affected they were by the traditional cooking methods and its consequences, their capacity to help participate and their motivation to make the project work. The main priority was to make certain that it was not only the visible, voluble and easy to access that were invited.

The meeting took place on the 30th November 2010 at the Mesacco Building in Chuka Town. It was attended by co2balance staff, local and international NGOs and individuals: The stakeholder meeting was attended by 62 people, (36%) and men (64%) present.

Stakeholders were encouraged to actively participate in the meeting, aiding in creating a sustainable development matrix and discussing how the sustainable development indicators identified could be monitored. At the end of the meeting all stakeholders were invited to fill out a feedback form.

E.2. Summary of the comments received:

Shown below is a selection of comments representative of those received at the end of the meeting.

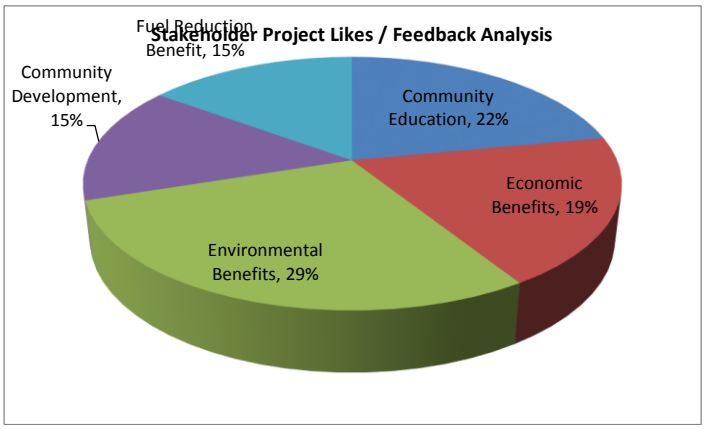
Name	**Jasper Msake (Feedback form 3)**

What is your impression of the meeting?	Learn a new thing and improve economy in community
What do you like about the project?	I would like the project to attain its goals so people can save the energy
What do you not like about the project?	What I don't like is that the project should not fail it should prosper
Signature	See LSCR.

Name	**Judith Karaai (Feedback Form 5)**
What is your impression of the meeting?	My information is to say thank you for your good work I am now teaching my group and others
What do you like about the project?	To make work easy and save time
What do you not like about the project?	Everything about the project is good
Signature	See LSCR

Name	**Fredrick Gitari (Feedback Form 6)**
What is your impression of the meeting?	I'm impressed by the knowledge that co2balance gives time to the people of the community. Im also impressed that the project gives community better health
What do you like about the project?	I would like the project to be 'enlarged' to the community it will also uplift the standard of the community it will give less time in preparing meals
What do you not like about the project?	The project is up to date
Signature	See LSCR.

Name	**James Robert (Feedback Form 7)**
What is your impression of the meeting?	To learn and know about co2balance
What do you like about the project?	To improve our environment for better standard of life and to protect our forests
What do you not like about the project?	Nothing
Signature	See LSCR.



The overall consensus was that the meeting was successful and informative. Participants felt that they were made fully aware of the project and its objectives, and that their questions were answered.

Below are some comments extracted from the feedback forms that relate directly to the graph / indicators:

Environmental benefits:
Feedback form 2: "It protects the environment through prevention of mass tree felling and the environment is everything"

Feedback form 9: "The project will help the community save the environment by allowing the trees to grow, save time normally spent collecting firewood; the health and cleanliness of the kitchen."

Fuel Reduction Benefit:
Feedback form 4: "The project will help people to use little firewood and also will help to conserve environment and destroying our trees and forests within our district"

Feedback form 24: "This jiko [stove] will save us from using so much wood."

Community Education:
Feedback form 15: "Education on awareness of new co2balance cooking method."

Economic Benefits:
Feedback form 20: The project will enhance the community access more savings from energy expenditure."

Feedback form 23: "It will save people time and money."

Community Development Benefits:
Feedback form 29: "It's good. To improve the living standards of the community."

Fee back form 30: "It's a good initiative to improve the living standards of the community."

The only dislikes about the project related to 2 points

- The duration and start time of the meeting. Due to late arrivals of Local officials the start time was not kept. We had to begin an hour later as we could not start without key community figures. This was observed by participants and commented on in some of the feedback forms. When the meeting was opened we apologised for the late start. 4 of the participants felt that the meeting should have gone on for a little longer. We spoke to the District Officer about this, and were told that we should not be concerned. We had covered all the relevant topics, and that we had done what we had intended to do. He said that often within these communities, some people prefer longer meetings as they feel that if the meetings are longer they will be provided with meals.
- The second dislike of the project was that co2balance was unable to provide schools and local NGO's with institutional stoves.
- Both of these are not True Dislikes of the project.

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

No stakeholder comments needed to be taken into account leading to no modifications of any aspects of the project

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Please refer to the Passport document to see proof letter.

Annex 3

BASELINE INFORMATION

See supplementary files for the NRB study.

See supplementary files for baseline report.

Annex 4

MONITORING INFORMATION

- - - -

See Passport document.