Component project activity design document form

(Version 09.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the CPA	Top Third Ventures Stove Programme CPA KE0003 – BURN Efficient Cookstoves for Kenya supported by Republic of Korea CPA reference number: CPA KE0003
Scale of the CPA	☐ Large-scale ☒ Small-scale
Version number of the CPA-DD	3.2
Completion date of the CPA-DD	09/06/2020
Title and UNFCCC reference number of the registered CDM PoA	Top Third Ventures Stove Programme (CDM Ref: PoA 9265)
Title and reference number of the corresponding generic CPA	Top Third Ventures Stove Programme CPA ###### Generic CPA
Coordinating/managing entity	BURN Manufacturing Co.
Host Party	Kenya
Applied methodologies and standardized baselines	AMS-II.G – Energy efficiency measures in thermal applications of non-renewable biomass (Version 04.0)
Sectoral scopes linked to the applied methodologies	03
Estimated amount of annual average GHG emission reductions	42,093 tCO2e

SECTION A. Description of component project activity (CPA)

A.1. Purpose and general description of CPA

Overview and purpose of the CPA

The CDM Programme Activity (CPA) Implementer will operate CPA under the Programme of Activities (PoA). The CPA Implementer will have a contractual agreement with the Coordinating/Managing Entity (CME) of the PoA describing the terms under which the efficient cooking technologies are distributed, replaced/repaired, and monitored. The purpose of the CPA is to achieve widespread distribution and effective use of efficient cooking technologies in low-income rural households. The CPA Implementer is Korea Carbon Management Ltd. (KCM), a company registered in the Republic of Korea with company registration number 142-81-56603. KCM provides all implementation and ongoing project operation costs for the project under this CPA.

Consumers who agree to the terms of the PoA/CPA will cede all rights to any CERs resulting from the CPA. By using the ICS, the consumers assign and transfer all right, title and interest to all benefits (including CERs) arising from its use to KCM, and permanently waive any claim or right to such benefits. In addition, consumers are requested to participate in the monitoring surveys or water boiling tests if randomly sampled from the database.

Consumers who do not agree to the terms of the PoA/CPA will not be included under the CPA or monitored throughout the crediting period of the CPA.

KCM has fully sponsored and owns this CPA. On behalf of KCM, BURN LLC will work with local Kenyan third-party partner companies to distribute the stoves to end users. KCM will provide all implementation costs for the CPA and fully subsidize the cost of efficient cookstoves to distributors.

Target Group and Location

The target group of the CPA are rural households using non-renewable biomass (firewood) with a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney, prior to receipt of an efficient cooking stove. The CPA will cover the Republic of Kenya, which is within the physical/geographical boundary of the PoA.

Technology

The CPA deploys an efficient cooking stove known as Kuniokoa. The technology was designed and developed by BURN. The technology has a thermal efficiency of 41.90% and is intended for use with fuel wood. The Kuniokoa stove's design takes into account the local cooking culture in the project area to ensure that improvements in technology and improved standards of living do not come at the expense of cultural traditions. See the technical specifications in section A.3 of the CPA-DD.

Record Keeping System

The CPA Implementer will comply with the requirements of the CME. The CME will operate and manage an electronic data management system that will store information on and track all efficient cooking technologies under the PoA. The system will contain the following information for each efficient cooking stove:

1. Unique Serial Number (USN) representing the stove number and CPA under which the stove is operating;
2. Contact details of the end-user (e.g. Name, address, mobile number, or national ID number);
3. Technology Details (Model type, purchase date).

Linking the USN to the contact details of the end-user allows for the tracking and identification of each efficient cooking unit.

The USN has the following format comprising of 9 digits[1]:

1st digit	2nd digit	3rd	4th	5th	6th	7th	8th	9th
Product ID	100000th	10000th	1000th	100th	10th	Random	Random	1st
ID	S1	S2	S3	S4	S5	R1	R2	S6

Each section on the USN will identify the product as follows:

- Product type: the first digit identifies the stove type (Kuniokoa)
- # Production number: S1 to S6 are digit slots for a sequential numbering ordered by time of production, allowing for 1 million unique serial numbers. For instance, the first stove off the line would have "000000" for its S1-S6 digits.
- Random digits: R1 and R2 are 2 random digits placed in slots 7 & 8, to make the USN unpredictable to outside parties

Example for USN: 202728110
- "2" stands for Kuniokoa product ID
- "027280" for S1-S6, meaning it was the 27,281st Kuniokoa produced
- "11" for R1-R2, the random digits

The data for the system will be updated and modified as required to allow for optimal performance of CPA implementation and monitoring. All data will be stored for at least two (2) years after the expiry of the crediting period.

Baseline scenario
The stoves used by households in rural areas of Kenya at present, include primarily traditional 3-stone fires (84.5%) and to a minor extent other traditional stoves (5.7%), improved stoves (3.7%) and the rest being stoves used with other fuels (kerosene, gas, electricity). Thus, cooking using biomass fuel over traditional inefficient stoves remains the prominent cooking practice.

Emission reductions
The estimated amount of annual average GHG emission reductions is 42,093 tCO2e.

A.2. Location of CPA

The geographic boundary of the CPA is the Republic of Kenya.

A.3. Technologies/measures

The CPA will deploy the efficient firewood cooking stove known as Kuniokoa, which has been designed and developed by BURN Manufacturing Co.. Please see the technical specifications in the following table. The CPA implementer may opt to distribute other stove models in this CPA over time.

Stove Manufacturer	BURN	

[1] It is possible that the USN format may change in future.

Stove Model	Kuniokoa
Stove Type	Natural draft, Side-Feed Semi-Gasifier Stove

Materials

Stove Body	CRCA Carbon Steel painted high gloss black epoxy powder coat
Pot Rest	StainlessSteel
Burning Chamber	StainlessSteel
Fuel FeedingDoor	StainlessSteel
Stick Shelf	CRCA
Legs	Aluzinc

Measurements

Height	cm	80.5 cm
Diameter (stove top)	cm	28.2 cm
Fuel FeedingDoorOpening	cm	10.6 cm
Weight	kg	4 kg
Fuel Chamber Volume	cm^3	144.3 cm^3
Packaging Dimensions	cm	30.0 L x 30.0 W x 32.5 H

WBT Results

Parameter	**Unit**	**Value**
Thermal Efficiency (average of cold start, hot start and simmering phases)	%	41.90%
Firepower	kW	3.13
Boil Time	min	26.13
HP CO	g/MJd	1.85
HP PM2.	g/MJd	125

Lifetime

Warranty	2 years
EstimatedLifetime[2]	3-4 years

[2]The lifetime of the project devices may go beyond 4 years. Hence, depending on the usage rate of the stoves, stoves will be either removed from the database after the end of its lifetime and not credited anymore or remain in the database for crediting until the moment a significant drop in usage rate is observed. As an alternative, worn out ICS may be replaced by newly distributed stoves. Manufacturer's declaration about the ICS lifetime has been submitted to the validating DOE.

A.4. Coordinating/managing entity

The PoA had been registered with the CME 'Top Third Ventures Limited'. Later on, the CME has been changed to BURN Manufacturing Co., a company based in the United States of America.

A.5. Parties and CPA implementer

Parties involved	CPA implementers	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Switzerland	Korea Carbon Management Ltd. (Private entity)	No

A.6. Public funding of CPA

No public funding has been received nor is envisaged to be received for the development or implementation of the CPA. In the unlikely event of any public funding, it would be ensured that it would not result in the diversion of Official Development Assistance from any Annex I country. An official statement has been provided to this effect by the CPA implementer.

A.7. History of CPA

The proposed CPA is neither registered as a CDM project activity nor included in another registered CDM PoA.

The proposed CPA is not a project activity that has been deregistered.

The proposed CPA is not a CPA that has been excluded from a registered CDM PoA.

The assessment of former project activities in the proposed CPA boundary is as follows:

CDM Reference	Project Title	MethodologyApplied
1404	"35 MW Bagasse Based Cogeneration Project" by Mumias Sugar Company Limited (MSCL)	ACM0006 ver. 4
2975	Olkaria III Phase 2 Geothermal Expansion Project in Kenya	ACM0002 ver. 8
3773	Olkaria II Geothermal Expansion Project	ACM0002 ver. 10
4513	Lake Turkana 310 MW Wind Power Project	ACM0002 ver. 11
3206	Aberdare Range/ Mt. Kenya Small Scale Reforestation Initiative Kamae-Kipipiri Small Scale A/R Project	AR-AMS0001 ver. 5
3207	Aberdare Range / Mt. Kenya Small Scale Reforestation Initiative Kirimara- Kithithina Small Scale A/R Project	AR-AMS0001 ver. 5
5023	Redevelopment of Tana Hydro Power Station Project	ACM0002 ver. 12
5585	Aberdare Range/ Mt. Kenya Small Scale Reforestation Initiative Kibaranyeki Small Scale A/R Project	AR-AMS0001 ver. 5
6549	Nairobi River Basin Biogas Project	AMS-I.E. ver. 4
6625	60 MW Kinangop Wind Park Project	ACM0002 ver. 12
7410	Karan Biofuel CDM project – Bioresidues briquettes supply for industrial steam production in Kenya	AMS-I.C. ver. 19
7783	Optimisation of Kiambere Hydro Power Project	ACM0002 ver. 13
8210	Corner Baridi Wind Farm	ACM0002 ver. 13
8775	Kipeto Wind Energy Project	ACM0002 ver. 13

8646	Olkaria IV Geothermal Project	ACM0002 ver. 13
8643	Olkaria I Units 4&5 Geothermal Project	ACM0002 ver. 13
8561	Energy efficiency improvement project through modification of heat exchanger network at Kenya Petroleum Refineries Ltd	AMS-II.D. ver. 12
9785	Restoration of Degraded Lands through Reforestation in MAU Forest Complex, Kenya	AR-ACM0003
9789	Restoration of Degraded Lands through Reforestation in Aberdare Forest Complex & National Park area, Kenya	AR-ACM0003
9960	5.1MW Grid Connected Wind Electricity Generation at Ngong Hills, Kenya.	AMS-I.D. ver. 17

As per the table above, no former project in Kenya shares the same technology/measure as that involved in the proposed CPA.

The assessment of former PoAs in the proposed CPA boundary is as follows:

CDM PoA Reference	Title	Methodology
10341	MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Africa	AMS-III.AR. ver. 5 AMS-II.G., ver. 8 AMS-III.AV. ver. 5
10175	MPG Geothermal Energy PoA	ACM0002 ver.16
9164	Installation of Energy Efficient Transformers (IEET)	AM0067 ver. 2
9948	Impact Carbon Global Safe Water Programme of Activities (PoA)	AMS-III.AV., ver.4
7398	Standard Bank Energy Efficient Commercial Lighting Programme of Activities	AMS-II.C. ver. 13
9384	Kenya Improved wood stoves project	AMS-II.G. ver. 3
9071	TATS Solar Lantern Programme of Activities	AMS-III.AR. ver. 4
9265	9265 Top Third Ventures Stove Programme	AMS-II.G. ver. 4
8239	African Clean Energy Switch – Biogas (ACES-Biogas)	AMS-I.E. ver. 5
7734	SimGas Biogas Programme of Activities	AMS-I.I. ver.4
8777	East Africa Renewable Energy Programme (EA-REP)	AMS-I.D. ver. 17
8637	Green Light for Africa	AMS-II.J ver. 4

5341	Improved Cooking Stoves Programme of Activities in Africa	AMS-II.G ver. 3
7489	Project to replace fossil fuel based lighting with Solar LED lamps in Africa	AMS-III.AR. ver. 3
7359	PoA for the Reduction of emission from non-renewable fuel from cooking at household level	AMS-I.E. ver. 4
8438	Clean Cook Stoves in Sub-Saharan Africa by ClimateCare Limited	AMS-II.G ver. 4
5962	International water purification programme	AMS-III.AV. ver. 3
7470	NuruLighting Programme	AMS-III.AR. ver. 2
7522	Standard Bank RenewableEnergy Programme	ACM0002 ver. 12
6606	KTDA Small Hydro Programme of Activities	AMS-I.D. ver. 17
7014	Improved Cook Stoves for East Africa (ICSEA)	AMS-II.G ver. 3 AMS-I.E ver. 6
6110	Barefoot Power Lighting Programme	AMS-III.AR
5336	Efficient Cook Stove Programme: Kenya	AMS-II.G ver. 3
7997	BioLiteImproved Cook stoves Programme	AMS-II.G ver.3

As per aforesaid, the proposed CPA is in the same host country as that of 7 former PoAs sharing similar technology / measure (i.e. improved cookstoves) as follows:

CDM PoA Reference	Title	Methodology
10341	MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Africa	AMS-III.AR. ver. 5 AMS-II.G., ver. 8 AMS-III.AV. ver. 5
9384	Kenya Improved wood stoves project	AMS-II.G. ver. 3
5341	Improved Cooking Stoves Programme of Activities in Africa	AMS-II.G ver. 3
8438	Clean Cook Stoves in Sub-Saharan Africa by Climate Care Limited	AMS-II.G. ver. 4
7014	Improved Cook Stoves for East Africa (ICSEA)	AMS-II.G. ver. 3
5336	Efficient Cook Stove Programme: Kenya	AMS-II.G. ver. 3
7997	BioLite Improved Cook stoves Programme	AMS-II.G. ver. 3

It is hereby declared that the proposed CPA will not lead to the discontinuation or modification of the former projects/PoAs and does not decrease the GHG emission reductions or net anthropogenic GHG removals by the former project/PoAs, and that the proposed CPA complies with the following conditions:

Requirement	Justification
a) It utilizes both a different measure and a different technology from those of the former project	The ICS models / units, namely the Kuniokoa firewood stoves distributed under the proposed CPA are unique to this PoA and are not included in any of the former carbon projects/PoAs listed above.
b) It does not share or utilize any of the assets of the former project;	The ICS units under the proposed CPA are uniquely identifiable by a serial number and is uniquely assigned to the proposed CPA. The proposed CPA does not utilize any assets of former project/PoA.
c) It utilizes a different resource type compared to the former project.	The ICS units under the proposed CPA are uniquely identifiable by a serial number and is uniquely assigned to the proposed CPA. The proposed CPA does not utilize same resource as any former project/PoA.

A.8. Debundling

Not applicable. Since CPA consists solely of units that qualify as 'microscale CDM units' (see section F, eligibility criterion 'Additionality'). See paragraph 124(n) of CDM Project Standard for PoAs, version 02.0

SECTION B. Application of methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

AMS-II.G "Energy efficiency measures in thermal applications of non-renewable biomass" (Version 04.0)

B.2. Project boundary, sources and greenhouse gases (GHGs)

The CPA boundary is limited to the Republic of Kenya. The GPS coordinates from the Republic of Kenya are the following:
0°10'36.73" N 37°54'29.98" E[3]

Map of Kenya:

[3] https://latitude.to/map/ke/kenya, accessed on 11/07/2019

The sources and GHGs included within the project boundary are discussed below:

Source		GHG	Included?	Justification/Explanation
Baseline	CO2 emissions from combustion of non-renewable woody biomass in low-efficiency three-stones fires or traditional stoves	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions
Project	CO2 emissions from combustion of non-renewable woody biomass in improved cook stoves distributed by the project activity	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions

B.3. Establishment and description of baseline scenario

As per the applied methodology AMS-II.G, version 04, the baseline scenario is the use of fossil fuels for meeting similar thermal energy needs.

Biomass remains the predominant fuel for cooking in Kenya. Nationwide 54.6% and 14.6% of Kenya's household population utilize firewood and charcoal for cooking respectively thereby exerting enormous pressure on the environment. 84.3% of rural and 16.1% of urban population uses firewood

for cooking. On the other hand, 8.9% of rural and 21.9 % of urban population uses charcoal for cooking[4].

The stoves used by households in rural areas of Kenya at present, include primarily traditional 3-stone fires (84.5%) and to a minor extent other traditional stoves (5.7%), improved stoves (3.7%) and the rest being stoves used with other fuels (kerosene, gas, electricity). Thus, cooking using biomass fuel over traditional inefficient stoves remains the prominent cooking practice.

Hence, in the baseline scenario, the project households would have predominantly used 3-stone fires (84.5%), and to a minor extent other traditional stoves (5.7%) and improved stoves (3.7%). In the project activity, the 3-stone fires and traditional baseline stoves shall be replaced by improved cookstoves with higher thermal efficiency for meeting the same cooking needs / service levels. The baseline has therefore been established according to the methodology applied, i.e. it is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs as that provided by the project stove (Paragraph 4 of AMS-II.G. Version 04.0).

Percentage distribution of households by primary type of cooking appliance in rural areas[5]					
Biomass stoves					Other stoves with other fuels
Traditional stone fire	Improved traditional stone fire	Ordinary Jiko (traditional stove)	Improved Jiko (improved stove)	Total	Total
71.7%	12.8%	5.7%	3.7%	93.9%	6.1%
Proportion of biomass stoves					
76.36%	13.63%	6.07%	3.94%	100%	
Traditional stoves			**ICS**		
96.06%			3.94%		

As the table above shows, improved cookstoves (ICS) constitute of less than 4% of all biomass stoves. The figure has been calculated based on numbers published in the 2015/16 Kenya Integrated Household Budget Survey. The Document 'Gender and Equity in Bioenergy Access and Delivery in Kenya' (2008)[6] confirms 4% improved firewood stove use in rural areas in Kenya. Hence, 4% ICS penetration rate has been used when calculating the weighted average baseline stove efficiency.

AMS-II.G Version 04.0 allows the efficiency of the baseline appliance (η_{old}) to be determined through 2 options:

1. Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than on type of system is being replaced;
2. A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used.

The CPA applies Option 2, using a default value of 0.10 for unimproved stoves or three stone fires, and a default value of 0.20 for improved stoves. As the baseline in rural Kenya is a 4% penetration rate of efficient stoves, the parameter η_{old} is determined through a weighted average:

$$\eta_{old} = 0.96 \times 0.10 + 0.04 \times 0.20$$

[4]Table 3.18 Basic Report Based on 2015/16 Kenya Integrated Household Budget Survey

[5]Table 3.19 Basic Report Based on 2015/16 Kenya Integrated Household Budget Survey

[6] Practical Action. Gender and Equity in Bioenergy Access and Delivery in Kenya, 04/2008. Page 5.

$\eta_{old} = 0.104$

In regard to fNRB, details are provided in Appendix 3.

B.4. Estimation of emission reductions

B.4.1. Explanation of methodological choices

Following AMS-II.G Version 04.0 *Energy Efficiency in Thermal Application of Non-Renewable Biomass*, the following methodological choices are applied to SSC-CPAs under the PoA:

Calculation of Emission Reductions

$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_{fossilfuel}}$ (equation 1 in the methodology)

Where:

ER_y = Emission reductions during the year *y* in tCO_2e

$B_{y,savings}$ = Quantity of woody biomass that is saved in tonnes

$f_{NRB,y}$ = Fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable biomass

$NCV_{biomass}$ = Net calorific value of the non-renewable woody biomass that is substituted

$EF_{projected\_fossilfuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers

With

$B_{y,savings}$ estimated using Option 2:

$B_{y,savings} = B_{old} \times \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$ (equation 3 in the methodology)

Option 2 is used as the studies and surveys are available to determine the efficiency of the baseline technology and the monitoring of the efficiency of the new technology employed under the CPA is more cost-effective than the monitoring requirements of Option 1 and Option 3.

Calculation of Baseline Emissions

Parameter B_{old} is determined as per paragraph 7 of AMS-II.G Version 04.0, which states the following:

B_{old} is determined by using one of the following two options:

a) Calculated as the product of the number of systems multiplied by the estimate average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage,

OR

b) Calculate from the thermal energy generated in the project activity.

The CPA determines B_{old} through option a). The annual per capita woody biomass consumption data as well as data on the average household size in rural areas are readily available and monitoring the thermal energy generated by the project technology is difficult and costly.

It follows that B_{old} is the product of the number of systems multiplied by the estimated average annual consumption of woody biomass per appliance (tonnes/year). B_{old} is defined through the following:

$B_{old} = B_{old,appliance} \times N_y \times L_{Total}$

$B_{old,appliance}$ is the quotient of the annual quantity of woody biomass consumed in the baseline in households (t/HH/year) and number of improved stoves per household.

$$\boldsymbol{B_{old,appliance} = \frac{B_{old,HH}}{N_{s,HH}}}$$

Where:

$B_{old,appliance}$ = Annual quantity of woody biomass consumed per device in the baseline in households (t/HH/year)

$B_{old,HH}$ = Annual quantity of woody biomass consumed in the baseline in rural households in Kenya (t/HH/year)

$N_{s,HH}$ = Number of improved stoves per households

$B_{old,HH}$ is the product of the calculated weighted average annual per capita consumption value following the values stated in the report 'Analysis of woodfuel supply, demand and sustainability in Kenya' and the average household size in rural areas of Kenya.

$B_{old,HH} = B_{old,P} \times N_{p,HH}$

Where:

$B_{old,P}$ = Annual per capita consumption value (t/person/year)

$N_{p,HH}$ = Number of people per household in rural areas of Kenya

Parameter N_y represents the equivalent full-time appliances in operation during monitoring period y

Equation 10: $N_y = N_{y,FTe} \times R_{y,usage}$

Parameter $N_{y,FTe}$ represents the equivalent full-time appliances during monitoring period y. This is derived from the distribution record of total appliances distributed up to the end of the monitoring period and the distribution date of the appliance. The appliance is assumed to be in operation as of

the day after next from the date of distribution[7]. Dividing the days of the monitoring period during which the appliance was in operation by the total days in the monitoring period yields the full-time equivalent for each appliance. The sum of the full-time equivalent is the value of $N_{y,FTe}$. Appliances distributed prior to the monitoring period are assigned a value of 1 because they operated throughout.

Parameter $R_{y,usage}$ is derived from a survey of the end-users of all appliances in the distribution record. The survey will assess the following:

a) if the appliance is still in operation;
b) what percentage of the cooking demand is satisfied by the appliance (to account for continued use of the baseline technology).

Appliances found to be not in operation will be excluded in the determination of $N_{y,FTe}$ and $R_{y,usage}$ during future monitoring.

As noted under point b) the continued use of baseline technology will be accounted for through exclusion of the fuel-wood consumption of those stoves from B_{old}.

AMS-II.G Version 04.0 allows the efficiency of the baseline appliance (η_{old}) to be determined through 2 options:

1. Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than on type of system is being replaced;
2. A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used.

The CPA applies Option 2, using a default value of 0.10 for unimproved stoves or three stone fires, and a default value of 0.20 for improved stoves.

Calculation of Leakage Emissions

As per AMS-II.G Version 04.0, paragraph 22 details the requirements for a PoA implementing the methodology to account for leakage:

> The use of this methodology in a project activity under a programme of activities is legitimate if the following leakages are estimated and accounted for, if required on a sample basis using 90/30 precision for the selection of samples, and accounted for:
> a) Use of non-renewable woody biomass saved under the project activity is to justify the baseline of other CDM project activities can also be a potential source of leakage. If this leakage assessment quantifies a portion of non-renewable woody biomass saved under the project activity that is then used as the baseline of other CDM project activities then B_{old} is adjusted to account for the quantified leakage;
> b) Increase in the use of non-renewable woody biomass outside the project boundary to create non-renewable woody biomass baselines can also be a potential source of leakage. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass outside the project boundary then B_{old} is adjusted to account for the quantified leakage;
> c) As an alternative to subparagraphs a) and b), B_{old} can be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

[7] Can be checked by the DOE at the time of verification.

The CPA opts to multiply B_{old} by a net gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. Accounting for leakage with a net gross adjustment factor reduces the costs of monitoring and ensures a conservative calculation of emission reductions.

Calculation of Fraction of Non-Renewable Biomass (fNRB)

The PoA states that *as per paragraph 23 of AMS-II.G, version 04.0, the following conditions apply for the value of fraction of non-renewable biomass applied in a CPA of a PoA. The choice between (a) sub-national values applied at each CPA level; and (b) national value(s) applied at the PoA level shall be made ex- ante. For the PoA the choice is for (a), reporting the fraction of non-renewable biomass at the CPA level, as the boundary of the PoA can be expanded in include additional countries.*

Hence, the fNRB for Kenya is calculated for this CPA at a CPA-level by applying the 'Methodological tool: Calculation of the fraction of non-renewable biomass', version 02.0. The value is fixed ex-ante for the crediting period.

The fNRB is calculated as shown below:
The fraction of woody biomass that can be established as non-renewable, is:

$$fNRB = \frac{NRB}{NRB + RB}$$

Where:
fNRB = Fraction of non-renewable biomass in the country/region or project area (fraction or %)

NRB = Quantity of non-renewable biomass (t/yr) in the country/region or project area (t/yr)

RB = Quantity of renewable biomass in the country/region or project area (t/yr)

The quantity of NRB in a country- or region-specific shall be determined by calculating the total consumption of wood (H) in the country or region and then deducting the quantity of renewable biomass (RB) from it.

$$NRB = H - RB$$

Where:

H = Total annual consumption of wood in the absence of the project activity in the country/region or project area (t/yr)

H is calculated, accounting for all consumption within the country/region (not only wood fuel but also timber and industrial consumption).

$$H = HW_{region}\, x\, N_{region} + TI\_region$$

HW_{region} = Average household wood fuel consumption, including fuelwood and charcoal in the country or region (t/yr/household)

TI_region = Non-domestic woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of wood in ovens, boilers etc.) and all woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or land areas in the country/region for which the estimate of fNRB is to be made (t/yr)

N_{region} = Number of households consuming wood fuel for thermal applications within the country/region (households)

Renewable biomass (RB) in the country/region/area is estimated using the equation below.

$$RB = \sum(MAI_{forest,i} \times (F_{forest,i} - P_{forest})) + \sum(MAI_{other,i} \times (F_{other,i} - P_{other}))$$

Where:

$MAI_{forest,i}$ = Mean Annual Increment of woody biomass growth per hectare in sub- category *i* of forest areas (t/ha/yr)

$MAI_{other,i}$ = Mean Annual Increment of woody biomass growth per hectare in sub- category *i* of other wooded land areas (t/ha/yr)

$F_{forest,i}$ = Extent of forest in sub-category *i* (ha)

$F_{other,i}$ = Extent of other wooded land in sub-category *i* (ha)

P_{forest} = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (ha)

P_{other} = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas (ha)

i = Sub-category i of forest areas and other wooded land areas

Details are provided in the ER calculation excel spreadsheet and in Appendix 3.

B.4.2. Data and parameters fixed ex-ante

Data/Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass

Source of data	-Worldbank Data (for population figure) -UN (for annual population growth) -Worldbank Data (for proportion urban to rural population) -WISDOM report 'Analysis of woodfuel supply, demand and sustainability in Kenya' (for average woodfuel consumption) -Global Forest Resources Assessment 2015, Country Report Kenya (for forest areas and forest loss) -GTZ Eastern Africa Online Resource Base[8] (for MAI) -Protected Planet (for protected areas) For more details, see Appendix 3
Value(s) applied	0.914
Choice of data or measurement methods and procedures	Calculated
Purpose of data	Calculation of baseline emissions
Additional comment	See Appendix 3 for more details. This calculation follows the methodological tool: 'Calculation of the fraction of non-renewable biomass', version 02.0 The calculated fNRB is slightly below the national default value of 92%[9] which expired on September 18, 2017.

Data/Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of the system being replaced
Source of data	-AMS-II.G, ver. 04.0 and -Surveys/studies: 2015/16 Kenya Integrated Household Budget Survey[10] and Practical Action, Gender and Equity in Bioenergy Access and Delivery in Kenya[11]
Value(s) applied	0.104
Choice of data or measurement methods and procedures	According to the applied option 2 of the methodology, 0.10 default value may be optionally used if the replaced system is the three stone fire or a conventional system lacking improved combustion air supply mechanism and flue gas ventilation system i.e. without a grate and without a chimney; for other types of systems a default value of 0.2 may be optionally used The penetration rate of 3-stone fire/conventional systems consists of 96%, whereas other types of systems (improved cookstoves) contribute to 4%. The weighted average baseline stove efficiency has been calculated as per the following: 0.104 = 0.96*0.1 + 0.04*0.2
Purpose of data	Calculation of baseline emissions

[8] https://energypedia.info/wiki/Biomass_Energy_Resources_in_Kenya

[9] https://cdm.unfccc.int/DNA/fNRB/index.html

[10] Basic Report Based on 2015/16 Kenya Integrated Household Budget Survey, Table 3.19

[11] Practical Action. Gender and Equity in Bioenergy Access and Delivery in Kenya, 04/2008. Page 5.

Additional comment	See ER calculation excel spreadsheet/worksheet 'Baseline stove efficiency' for the calculation of the value.

Data/Parameter	$B_{old,P}$
Data unit	t/person/year
Description	Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	WISDOM report 'Analysis of woodfuel supply, demand and sustainability in Kenya', Table A1.2.[12] KIHBS 2015/16, Table 3.18[13] Default IPCC value taken from https://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf (page 1.45) for conversion factor from charcoal to fuelwood (6:1)
Value(s) applied	0.627
Choice of data or measurement methods and procedures	The calculated weighted average annual per capita consumption value for rural areas following the values stated in the WISDOM report 'Analysis of woodfuel supply, demand and sustainability in Kenya' is applied. Since the CPA distributes ICS in rural areas of Kenya.
Purpose of data	Calculation of baseline emissions
Additional comment	See ER calculation excel spreadsheet / worksheet 'Baseline fuelwood consumption' for the calculation of the value.

Data/Parameter	$N_{p,HH}$
Data unit	People/HH
Description	Number of people per household in rural areas of Kenya
Source of data	Global Data Lab[14], https://globaldatalab.org/areadata/hhsize/
Value(s) applied	5.83
Choice of data or measurement methods and procedures	As per Global Data Lab, the average household size in rural areas is 5.91 people/HH (confirmed data for 2014). Since the estimated data for 2017 are slightly lower, the lower value of 5.83 people/HH is used for conservatism.
Purpose of data	Calculation of baseline emissions
Additional comment	The chosen figure is lower than the one stated in the power development plan 'Least-Cost-Power-Development-Plan_LCPDP'[15]. Page 71 of that document mentions that *'currently and according to statistical data this number is 5 persons in urban areas and 6.5 in rural areas'*

[12] R.Drigo, R.Bailis, A. Ghilardi, O. Masera. WISDOM Kenya, Analysis of woodfuel supply, demand and sustainability in Kenya, 05/2015.

[13] 2015/16 Kenya Integrated Household Budget Survey

[14] Global Data Lab is a research institute linked to the Radboud University which develops instruments for monitoring and analyzing the status and progress of societies. Instruments include indicators, specialized databases, and web-based tools. See: https://globaldatalab.org

[15] https://renewableenergy.go.ke/downloads/studies/LCPDP-2011-2030-Study.pdf

Data/Parameter	L
Data unit	Fraction
Description	Net to gross adjustment factor to account for leakages
Source of data	AMS-II.G, ver. 4, paragraph 22(c)
Value(s) applied	0.95
Choice of data or measurement methods and procedures	As per the methodology AMS II.G, vers. 04.0, a default value as provided under par. 22 can be optionally used to account for NRB leakage, in which case surveys are not required.
Purpose of data	Calculation of leakage
Additional comment	The 0.95 leakage default factor will be applied to all CPAs.

Data/Parameter	$EF_{projected_{fossilfuel}}$
Data unit	tCO2/TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS-II.G; vers. 04.0
Value(s) applied	81.6
Choice of data or measurement methods and procedures	This is the IPCC default value as provided by AMS II.G (vers. 04.0), paragraph 5.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$NCV_{biomass}$
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	IPCC default for wood fuel
Value(s) applied	0.0156
Choice of dataormeasurement methods and procedures	This is the IPCC default value as per volume 2, chapter 1,table 1.2[16]
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.4.3. Ex ante calculation of emission reductions

The emission reductions achieved by the CPA will be calculated ex-ante as per AMS-II.G, ver. 04.0 as follows:

$$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel}$$

Please note that the following ER value refers to one ICS. Please see the ER calculation excel spreadsheet with the calculations of baseline, project and leakage emissions as well as emission reductions.

[16] The methodology AMS-II.G, ver. 04 does not provide the exact value. However in the more recent versions of AMS-II.G the exact value of 0.0156 TJ/tonne is indicated.

$B_{y,savings}$	Quantity of woody biomass that is saved per project device	t/annum	2.3	Calculated
$f_{NRB,y}$	Fraction of woody biomass that can be established as non-renewable biomass	-	0.914	Calculated
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted	TJ/t	0.0156	IPCC default value
$EF_{projected\_fossil\_fuel}$	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers	tCO_2/TJ	81.6	AMS-II.G, version 04
ER_y	Emission reductions	$tCO_2/annum$	2.631	Calculated
BE_y	Baseline emissions	tCO2/annum	3.683	Calculated
Leakage Emissions	Leakage emissions	tCO2/annum	0.184	Calculated
PE_y	Project emissions	tCO2/annum	0.868	Calculated
ER_{ICS}	**Emission reductions per ICS**	**tCO_2**	**2.631**	Calculated

Quantity of woody biomass that is saved by each appliance ($B_{y,savings}$) is estimated using Option 2 as follows:

$$B_{y,savings} = B_{old} \times (1 - \frac{\eta_{old}}{\eta_{new}})$$

B_{old}	Annual quantity of woody biomass consumed per device in the baseline taking into account usage rate, stove stacking, leakage	t/annum	3.0	Calclulated
η_{old}	Efficiency of baseline device	-	0.104	Literature
η_{new}	Efficiency of project device (BURN stove)	-	0.419	WBT results
$B_{y,savings}$	Quantity of woody biomass that is saved per project device	t/annum	2.3	Calculated

B_{old} is determined through a 3-step approach:

1st step:

$B_{old,HH}$ is the product of the calculated weighted average annual per capita consumption value for rural areas following the values stated in the WISDOM report 'Analysis of woodfuel supply, demand and sustainability in Kenya' and the average household size in rural areas of Kenya.

$$B_{old,HH} = B_{old,P} \times N_{p,HH}$$

2nd step:

$B_{old,appliance}$ is the quotient of the annual quantity of woody biomass consumed in the baseline in rural households in Kenya (t/HH/year) and number of BURN stoves per household

$$B_{old,appliance} = B_{old,HH}/N_{s,HH}$$

3rdstep:

B_{old} is the product of annual quantity of woody biomass consumed per device in the baseline and usage rate and stove stacking rate (continued baseline stove use) and leakage default factor.

$$B_{old} = B_{old,appliance} \times R_{y,usage} \times L$$

$N_{y,FTe}$	Number of stoves	-	1	Assumption
$R_{y,usage}$	Usage rate	-	0.891	Assumptions: 99% stove operation rate and 10% continued baseline stove use (stove stacking)
$B_{old,P}$	Annual quantity of woody biomass that would have been used per person in rural household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices	t/person/year	0.627	Wisdom Kenya report, Table A1.2 KIHBS 2015/16, Table 3.18
$N_{p,HH}$	Number of people per household in rural areas of Kenya	people/HH	5.83	Global Data Lab https://globaldatalab.org/areadata/hhsize/
$B_{old,HH}$	Annual quantity of woody biomass consumed in the householdin the baseline	t/HH/year	3.657436738	Calculated
$N_{s,HH}$	Number of BURN stoves per household	Number	1.03	Assumption that 3% of the surveyed households use 2 or more Kuniokoa devices
$B_{old,appliance}$	Annual quantity of woody biomass consumed per device in the baseline	t/annum/stove	3.55	Calculated
L	Leakage	-	0.95	AMS-II.G
B_{old}	Annual quantity of woody biomass consumed per device in the baseline taking into account usage rate, stove stacking, leakage	t/annum	3.0	Calclulated

For the ex ante estimate of total emission reductions, please see B.4.4

B.4.4. 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 (2019-2020)	58,926	13,887	2,946	42,093
Year 2 (2020-2021)	58,926	13,887	2,946	42,093
Year 3 (2021-2022)	58,926	13,887	2,946	42,093
Year 4 (2022-2023)	58,926	13,887	2,946	42,093
Year 5 (2023-2024)	58,926	13,887	2,946	42,093
Year 6 (2024-2025)	58,926	13,887	2,946	42,093
Year 7 (2025-2026)	58,926	13,887	2,946	42,093
Year 8 (2026-2027)	58,926	13,887	2,946	42,093
Year 9 (2027-2028)	58,926	13,887	2,946	42,093
Year 10 (2028-2029)	58,926	13,887	2,946	42,093
Total	589,257	138,867	29,463	420,927
Total number of crediting years	10			
Annual average over the crediting period	58,926	13,887	2,946	42,093

B.5. Monitoring plan

B.5.1. Data and parameters to be monitored

Data/Parameter	η_{new}
Data unit	Fraction
Description	Efficiency of the system being deployed as part of the project activity

Source of data	Efficiency values from water boiling tests (WBTs) conducted on a representative sample of appliances
Value(s) applied	0.4190 (for ex-ante calculation value taken from manufacturer's specifications[17])
Measurement methods and procedures	A representative sample of appliances in operation will be chosen from the project's database. The sample will be representative of the age of appliances in operation. The mean of the sample values determines the parameter. η_{new} is determined as per the Water Boiling Test (WBT) protocol. A WBT will be performed on each appliance in the sample. The sample size will be determined based on expected variance but can be increased until the desired level of precision is achieved. Weighted average values will be used if monitoring covers more than one technology type in the same CPA-DD.
Monitoring frequency	Annual or biennial
QA/QC procedures	Experts trained in administering the test or accredited laboratories will carry out the WBT. Following the CDM PoA Sampling Standard, version 07.0, paragraph 21 and 22, a 95 per cent confidence and 10 per cent margin of error are required. Since CPAs are composed of microscale CDM units and sampling is conducted across CPAs in case that CPAs are homogenous. In the instance where the sample size fails to satisfy the confidence and margin of error requirements, either the lower bound of the 95 per cent confidence interval may be chosen or the sample size will be increased until the necessary precision is achieved.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	$N_{y,FTE}$
Data unit	-
Description	Number of full-time equivalent appliances in operation during the monitoring period
Source of data	Distribution record in electronic data management system detailing serial numbers and date of distribution for appliances.
Value(s)applied	16,000[18] (for ex-ante calculation)

[17] BURN Manufacturing Co. has conducted WBTs in its Design Lab following the WBT protocol 4.2.3 to determine the thermal efficiency for ex-ante calculation. The WBTs included cold start, hot start and simmering and the thermal efficiency has been calculated as an average of those 3 phases. The efficiency test results comply with a 95/10 confidence/precision level.

[18] Ex-ante calculation of emission reductions is based on 16,000 stoves. However, the number of stoves can be significantly higher, hence total emission reductions would be significantly higher than what is mentioned in the table under section B.4.4. There is no aggregate small-scale threshold for the CPA, since the project devices qualify as microscale CDM units. Hence there is no upper limit for including stoves under this CPA.

Measurementmethods and procedures	The parameter is calculated through the number of distributed stoves and the stove operating fraction during the monitoring period. Each ICS entered into the distribution database will be linked to a distribution date (recorded during distribution). Thus, for any monitoring period it is possible to calculate the period of time for which the stoves included in the emissions reduction calculations are deemed operating. If e.g. a stove has been operating for 180 days, then the operating fraction is 0.493 (=180/365 days). A stove will be counted as operational from the day after next following the stove distribution.
Monitoring frequency	Continuous
QA/QC procedures	All data in the electronic data management system can be verified through a mobile registration platform (EchoMobile).
Purpose of data	Calculation of baseline emissions
Additional comment	During monitoring, if it is found that more than one BURN Kuniokoa ICS is being used per household, any such additional ICS will be excluded from the emission reduction calculations by discounting ICS population from the database in equivalent proportion. This is reflected in the ER calculation by the parameter $N_{s,HH.}$

Data/Parameter	$R_{y,usage}$
Data unit	fraction
Description	Usage rate of the technology employed by the project activity
Source of data	Survey of end-users under the project activity
Value(s) applied	0.891 (for ex-ante calculation)
Measurementmethods and procedures	A representative sample of appliances will be chosen from the total distribution record. The sample will be representative of the age of appliances. The sample chosen will be surveyed to determine if the appliance is still in use (stove operation rate) and what per cent of the end-user's cooking requirements the appliance is meeting, i.e. to what extent the baseline stoves are still in use. The end value is an average proportion.
Monitoring frequency	Annual or biennial
QA/QC procedures	Following the CDM PoA Sampling Standard, version 07.0, paragraph 21 and 22, a 95 per cent confidence and 10 per cent margin of error are required. Since CPAs are composed of microscale CDM units and sampling is conducted across CPAs in case that CPAs are homogenous. In the instance where the sample size fails to satisfy the confidence and margin of error requirements, either the lower bound of the 95 per cent confidence interval may be chosen or the sample size will be increased until the necessary precision is achieved.
Purpose of data	Calculation of baseline emissions
Additional comment	A value of 0.891 is assumed for the ex-ante emissions reduction calculation. This assumes that 1% of stoves are not operational and that end-users still use the baseline stoves at a rate of 10%. 0.891 = 99% * 90%. These are estimates based on BURN's previous experiences in the cookstove market.

B.5.2. Sampling plan

The monitoring plan will be conducted in accordance with the requirements of the following CDM documents:

- AMS-II.G Version 04.0 *Energy Efficiency in Thermal Application of Non-Renewable Biomass*
- *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities Version 07.0*
- *Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities Version 04.0*

For each CPA the parameters to be determined during monitoring are:

a) η_{new} - Efficiency of the system being deployed as part of the project activity
b) $N_{y,FTe}$ - Number of full-time equivalent appliances in operation during the monitoring period
c) $R_{y,usage}$ - Usage rate of the technology employed by the project activity

Of the parameters to be determined during monitoring, the following are estimated through sampling:

i. η_{new} - Efficiency of the system being deployed as part of the project activity
ii. $R_{y,usage}$ - Usage rate of the technology employed by the project activity

The CPA Implementer provides monitoring information to the CME for the electronic data management system. The CME will operate and manage an electronic data management system that will store information on and track all efficient cooking technologies under the PoA. All data will be stored for at least two (2) years after the expiry of the crediting period (i.e. 12 years post start of the crediting period of the CPA). The system will contain the following information for each efficient cooking stove, which is collected and reported by the CME Implementer:

1. Unique Serial Number (USN) representing the stove number and CPA under which the stove is operating
2. Contact details of the end-user (e.g. Name, address, mobile number, or national ID number)
3. Technology Details (Model type, purchase date)

<u>Responsibilities</u>

Under the monitoring plan the CME and the CPA Implementer have the following responsibilities, which are reiterated throughout the monitoring plan:

1. Selection of Random Sample (CME)

   The CME is responsible for selecting the sample of appliances to be monitored randomly from the electronic data management system. The CME will provide the CPA Implementer with the appliances to be sampled during monitoring. Each appliance will be identified through the USN. The contact information of the end user for each appliance is provided to the CPA Implementer as well so the monitoring can be conducted.

2. Collection of Parameter Data (CPA Implementer)

   The CPA Implementer is responsible for conducting the surveys with the randomly selected end users provided by the CME and the WBT on the randomly selected appliances provided by the CME. The CPA Implementer will notify the CME of end-users that cannot be contacted or appliances that cannot be located. These appliances will be removed from the electronic database management system and the CME will randomly select new end-users and appliances to replace the ones removed so the sample size is maintained.

3. Analysis of Parameter Data and Monitoring Report (CME)

The CME will collect the sampled data from the CPA Implementer and analyse the data to determine the values of the sampled parameters during the monitoring period. The CME will prepare the monitoring report to be submitted to a Designated Operational Entity (DOE) for verification. The CME will communicate with the DOE and the CDM EB during the verification and issuance process.

Monitoring η_{new} and $R_{y,usage}$

The sample of the appliances to be monitored to estimate parameters η_{new} and $R_{y,usage}$ will be a simple random sample drawn from the electronic data management system.
A single sampling covering a group of CPAs for the parameters η_{new} and/or $R_{y,usage}$ is undertaken applying 95/10 confidence/precision for the sample size calculation.[19] Or alternatively, sampling is conducted separately for the CPA.
This CPA makes part of a single sampling covering a group of CPAs for the parameters η_{new} and $R_{y,usage}$.
The populations of all CPAs in the group are combined together, the sample size is determined and a single survey is undertaken to collect the data. All CPAs in the group are homogenous, i.e. apply the same ICS model and fuel, and target the same end-users (i.e. households) within the Host Country.
Since CPAs are solely composed of 'microscale CDM units', a 95/10 confidence/precision is applied for sampling surveys. [20]

The minimum sample size for parameter $R_{y,usage}$ will be calculated from the Equation 1 of the *Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities*:

$$n \geq \frac{1.96^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.96^2 p(1-p)}$$

With

n	The minimum sample size required
N	Total number of households (100,000[21])
p	Expected proportion (0.891)
1.96	Represents the 95% confidence required
0.1	Represents the 10% relative precision

From the equation above, the estimated sample size for 95/10 confidence/precision is 47. This equation will be used to estimate the initial sample size. If the required level of accuracy (confidence/precision) is not achieved the sample size can be expanded or alternatively the appropriate lower bound (95 per cent) will be used.

[19] This is in line with paragraph 21 of the Standard 'Sampling and surveys for CDM project activities and PoAs', version 07.0

[20] This is in line with paragraph 22 of the Standard 'Sampling and surveys for CDM project activities and PoAs', version 07.0

[21] Improved cookstoves are distributed through several CPAs. 100,000 has been taken as reference to calculate the initial sample size. Since sampling is expected to be carried out across CPAs. However, even if taking a smaller population size of e.g. 16,000 or a higher population size of e.g. 500,000, the sample size would not change. Since the population size at a certain scale does not have any influence on the sample size anymore.

The minimum sample size for parameter η_{new} will be calculated from the Equation 18 of the *Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities*, where the variance of the sample replaces the expected proportion, as the parameter to be estimated is not a proportion:

$$n \geq \frac{1.96^2 NV}{(N-1) \times 0.1^2 + 1.96^2 V}$$

With

n The minimum sample size required

N Total number of appliances (100,000)

V Expected variance (0.0005)[22]

1.96 Represents the 95% confidence required

0.1 Represents the 10% relative precision

From the equation above, the sample size for 95/10 confidence/precision is 1. If as per the Sampling Standard for Sampling and surveys for CDM project activities and PoAs (paragraph 13), the sample size calculation returns a value of less than 30 samples, the Student's t-distribution shall be used. However the t-distribution cannot be applied in this case, since the degrees of freedom would result in 0 (1- 1) for which the t-Table does not provide any t value. Hence, the CME decided to choose as initial sample size 3 and calculated the precision level. The 95/10 confidence/precision level was met, hence 3 was considered as an appropriate expected initial sample size.

If the required level of accuracy (confidence/precision) is not achieved the sample size will be expanded or alternatively the appropriate lower bound (95 per cent confidence) will be used.

To estimate the parameter η_{new}, a WBT will be performed on every appliance selected in the random sample when determining by individuals trained in the administration of the test. The sample will be representative of the age of appliances in operation. The average value for the efficiency across the samples will be used to estimate parameter η_{new} if the sample size satisfies the accuracy requirements. If the sample size is insufficient, the 95 per cent lower bound will be applied as described above or the sample size expanded.

Sampling Plan for η_{new}

Sampling Design	Objective and reliability requirements	The objective is determining the mean thermal efficiency of the CPA technologies operational during the monitoring period, with a 95/10 confidence precision.
	Target Population	The target population are all technologies deemed still in operation during the monitoring period
	Sampling Method	Simple Random Sampling

[22] This is the calculated variance based on the standard deviation resulting from the WBTs conducted by BURN Design Lab.

	Sample Size	The estimated minimum sample size as indicated above is 3. A single sampling covering a group of CPAs is undertaken applying 95/10 confidence/precision for the sample size calculation.
	Sampling Frame	The sampling frame is the electronic distribution database with a record of all appliances distributed under the CPA, disregarding appliances not in operation as determined when sampling $R_{y,usage}$.
Data to be Collected	Field Measurements	The field measurement conducted is a Water Boiling Test as developed by the Shell Foundation conducted at least once every 2 years. The test is administered after the technology is deemed in operation The equipment required for the test is the following: • Electronic scale with a capacity of at least 6kg and an accuracy of +/- 1g • Digital thermometer accurate to 0.1 degrees with thermocouple probe suitable for immersion in liquids • Timer • Wood moisture meter (optional)
	Quality Assurance/Quality Control	The test will be conducted by personal trained in the administration of the test. The results of the test will be recorded on a smartphone or computer and uploaded to a central database for analysis. The equipment required for administering the test will be calibrated on an annual basis.
	Analysis	The mean value of the thermal efficiency values for all technologies in the sample is determined.

Implementation	Implementation Plan	The sample of technologies selected for the WBT is drawn from the distribution database during the monitoring period. The testing team then travels to each technology to perform the WBT in person or stoves are transported to the laboratory. The team undertaking the tests will have all tools necessary for performing the test (scale, moisture meter, etc.) and previous experience conducting the WBT and recording the results.

A survey will be conducted to estimate parameter $R_{y,usage}$. The survey will consist of questions to a representative of the household in which the appliance is currently used. The representative must be of legal age. The representative will state what proportion of the households cooking needs are being met by the appliance deployed. If the representative states that the stove is not present in the household, broken, or performing none of the households cooking needs, the value for $R_{y,usage}$ for that appliance in the sample will be 0. If the representative states that all meals are prepared on the appliance deployed the value assigned is 1. For an appliance whose representative reports that the appliance is used for half of all meals, a value of 0.5 is applied. The average value for all sampled appliances is used to estimate $R_{y,usage}$. If the sample size is insufficient, the 95 per cent lower bound will be applied as described above or the sample size expanded. The sample will be representative of the age of appliances.

As per AMS-II.G Version 04.0 if the removal of the baseline technology cannot be assured, then continued use of the baseline technology using woody biomass must be accounted for. As removal of baseline technologies such as the three stone fire cannot be assured, parameter $R_{y,usage}$ accounts for continued use of the baseline technology, i.e. a low value for $R_{y,usage}$ indicates either extensive continued use of the baseline technology using woody biomass and/or low ICS operation rate.

Sampling Plan for $R_{y,usage}$

Sampling Design	Objective and reliabilityrequirements	The objective is determining the average proportion of usage of the CPA technologies during the monitoring period, with a 95/10 confidence precision.
	Target Population	The target population are technology users in the distribution database during the monitoring period.
	Sampling Method	Simple Random Sampling
	Sample Size	The estimated minimum sample size as calculated above is 47.

		A single sampling covering a group of CPAs is undertaken applying 95/10 confidence/precision for the sample size calculation[23].
	Sampling Frame	The sampling frame is the electronic distribution database with the contact information of all users of technologies distributed under the CPA
Data to be Collected	Field Measurements	The field measurement conducted is a survey assessing the proportion of cooking needs of the user met by the technology. There is no equipment required for sampling this parameter.
	Quality Assurance/Quality Control	The survey will be administered by personnel conversant in a common language within the CPA boundary and familiar with the local culture. The results of the survey will be recorded on a smartphone or computer and uploaded to a central database for analysis. The survey will be conducted in person or over the phone with the technology user or an immediate family member of the user who is above 18 years of age. No equipment is required for sampling this parameter, so no calibration frequency is stated
	Analysis	The mean value of the usage proportion from the surveys is determined
Implementation	Implementation Plan	The sample of users selected for the survey is drawn from the distribution database during the monitoring period. The testing team uses the contact information in the

[23] This is in line with paragraph 21 of the Standard 'Sampling and surveys for CDM project activities and PoAs', version 07.0.

		database to conduct the survey in person or over the phone with the user or an immediate family member who is above the age of 18 The results of the survey are electronically recorded and uploaded to a central database for analysis. The team administering the survey will be familiar with the purpose of the survey, the technology under the CPA, and the local culture.

Monitoring $N_{y,FTe}$

The equivalent full-time appliances in operation during the monitoring period are calculated from the distribution records in the electronic data management system. The USN of the appliance is recorded along with the date of distribution. The date of distribution for each appliance is used to determine the portion of the monitoring period during which the appliance was active. Appliances deployed under the project activity are assumed be in operation as from the day after next following the stove distribution, i.e. if the date of distribution is 29/07/2019, the start of operation is 31/07/2019. The days of operation for each appliance are divided by the total days in the monitoring period. For example, if the monitoring period is 365 days (i.e. 1 year) and an appliance that is deemed operational for 6 months of that period will be assigned a value of 0.5. This calculation will be performed across all appliances under each CPA through the distribution records of the electronic data management system. The sum of the operating fractions of all appliances determines the equivalent full-time appliances for the monitoring period.

B.5.3. Other elements of monitoring plan

Not applicable

SECTION C. Start date, crediting period type and duration

C.1. Start date of CPA

10/07/2019
This is the date when the first ICS has been distributed to an end-user under the CPA and registered through the mobile registration platform EchoMobile.

C.2. Expected operational lifetime of CPA

10 years

C.3. Crediting period of CPA

C.3.1. Type of crediting period

Fixed crediting period

C.3.2. Start date of crediting period

18/09/2019 or the date of inclusion to the PoA, whichever is later.

C.3.3. Duration of crediting period

10 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

Not applicable. The analysis of the environmental impacts is performed at the PoA level.

D.2. Environmental impact assessment

Not applicable. The analysis of the environmental impacts is performed at the PoA level.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

Not applicable. The solicitation of comments from local stakeholders has been performed at the PoA level.

E.2. Summary of comments received

Not applicable

E.3. Consideration of comments received

Not applicable

SECTION F. Eligibility for inclusion

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
1	Technology	Each CPA will employ efficient cooking technologies for use with non-renewable biomass with a minimum thermal efficiency of 20 per cent.	Description of technology and efficiency certificate from the national institute KIRDI (Kenya Industrial Research and Development Institute)[24]	Yes ..

[24] KIRDI is a testing institute accredited by the Clean Cooking Alliance (www.cleancookingalliance.org/technology-and-fuels/testing/centers.html)

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
2	Location	Each CPA will be located within the physical/geographical boundary of the PoA	The geographic reference/location indicated in section B.2 shows that the activity is within the physical/geographical boundary of the PoA.	Yes
3	Additionality	Each CPA will satisfy the criteria for demonstrating additionality of a small-scale project. The measurements and criteria ensuring eligibility are the following: • End-users are households or institutions or SMEs • Annual energy savings of each unit ≤ 1,800 MWh thermal	Each unit results in energy savings ≤ 1,800 MWh_{th} per annum, and the end-users of the technology are households.	Yes
4	Aggregate small-scale threshold	Not applicable. Since CPA consists solely of units that qualify as 'microscale CDM units' (see eligibility criterion 'Additionality'). See paragraph 124(m) of CDM Project Standard for PoAs, version 02.0	Aggregate small-scale threshold is not applicable. Please see tab 'Microscale threshold'/ER calculation excel spreadsheet demonstrating that the project devices qualify as microscale CDM units. The thermal energy savings per stove are 11.54 MWh/stove/year, hence clearly below the threshold of 1,800 MWh/stove/year.	Not applicable

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
5	De-Bundling	Not applicable. Since CPA consists solely of units that qualify as 'microscale CDM units' (see eligibility criterion 'Additionality'). See paragraph 124(n) of CDM Project Standard for PoAs, version 02.0	De-bundling is not applicable. Please see tab 'Microscale threshold'/ER calculation excel spreadsheet demonstrating that the project devices qualify as microscale CDM units. The thermal energy savings per stove are 11.54 MWh/stove/year, hence clearly below the threshold of 1,800 MWh/stove/year.	Not applicable
6	Double Counting of emission reductions	Each CPA will implement a unique identification system for every efficient cooking unit to avoid double counting of emission reductions.	Description of the unique identification system and adherence to the CME Management System.	Yes
7	Start Date	Each CPA will prove that the start date of the CPA is on or after the start date of the PoA by providing evidence of the start date of the CPA.	The start date of the activity is evidenced by a mobile data registration record.	Yes
8	Crediting Period	Each CPA will have a fixed crediting period which shall not exceed the end date of the PoA.	Section C.3.1 confirms that the CPA follows a fixed crediting period as defined in the PoA-DD. The start of the crediting period is 18/09/2019 or the date of inclusion to the PoA, whichever is later.	Yes
9	Public Funding	Each CPA will confirm that it is not receiving funding dedicated as Official Development Assistance (ODA)	A letter signed by the CPA implementer has been submitted to the DOE that the activity is not receiving public funding dedicated as ODA.	Yes

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
10	CME Approval	Each CPA will prove it has received the approval of the CME of the PoA	A letter signed by BURN Manufacturing Co. (CME) confirms the approval of the CPA.	Yes
11	Methodology	Each CPA will apply the baseline and monitoring methodology AMS-II.G Version 04.0 and specify values for the following parameters as per the guidance of the PoA: • η_{old} • $B_{old,household}$ • $f_{NRB,y}$	The CPA applies methodology AMS-II.G Version 04.0 and appropriate values for amongst others the following parameters have been defined: • η_{old} • $B_{old,household}$ • $f_{NRB,y}$ A complete list of parameters can be found under sections B.4.2. and B.5.1.	Yes
12	Target Group	Each CPA targets households and/or institutions and/or Small and Medium Enterprises (SMEs) in rural and/or urban areas	The target group in this CPA is households in rural areas as described in the project description.	Yes
13	Sampling Requirements	Each CPA will adhere to the sampling requirements stipulated by the CME in section I.7.2. of the generic CPA-DD.	Adherence to the sampling requirements of the PoA is described in section B.5.2. of the CPA-DD.	Yes
14	Stakeholder Consultation and Environmental Impact Analysis	Each CPA will satisfy requirements surrounding Local Stakeholder Consultation and Environmental Impact Analysis	Adherence to any requirements stipulated by the Stakeholder Consultation and Environmental Impact Analysis conducted at the PoA level is guaranteed. Both stakeholder consultation and environmental impact analysis have been conducted at PoA level.	Yes

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
15	Compliance with Applicability and Other Requirements of Methodology	Each CPA will comply with the applicability and other requirements of methodology AMS-II.G Version 04.0: • The activity comprises appliances involving efficiency improvements in the thermal applications of non-renewable biomass • Non-renewable biomass has been used since 31/12/1989 within the boundary of the activity.	Description of the CPA and the technology/measure implemented has been provided in section A.1. of the CPA-DD. Non-renewable biomass has been used since 31/12/1989 within the boundary of the activity: According to FAO Forest Resource Assessment, 2010, the forested area in Kenya reduced by 0.35 % between 1990 and 2000, by 0.34% between 2000 and 2005 and by 0.31% between 2005 and 2010. Therefore, between 1990 and 2010, Kenya lost its forests at an average rate of 0.32% per year. In total, between 1990 and 2010, Kenya lost 6.5% of its forest cover[25].	Yes

[25] http://www.fao.org/docrep/013/i1757e/i1757e.pdf, Table 3.

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
16	Double counting of project activities	Each CPA will confirm that it has neither registered as standalone CDM project activity, nor included in another registered PoA nor that the project activity has been deregistered.	The different carbon standard registries (UNFCCC, GS and VCS websites) have been checked. It is confirmed that the CPA has neither been registered as standalone CDM project activity, nor included in another registered PoA nor that the project activity has been deregistered. It has been confirmed by a letter signed by the CPA implementer.	Yes

Appendix 1. Contact information of CPA implementer

Organization name	Korea Carbon Management Ltd.
Country	Republic of Korea
Address	9F, N'deavor Tower, 45, Seocho-dearo 74-gil, Seocho-gu, Seoul, 06626, Republic of Korea
Telephone	+82 2 3487 6050
Fax	+82 2 3487 6051
E-mail	info@korea-carbon.com
Website	www.korea-carbon.com
Contact person	Mr. Thomas Winklehner

Appendix 2. Affirmation regarding public funding

A ODA declaration has been signed by the CPA implementer confirming that the project has not been financed by ODA. The declaration is available to the DOE upon request.

Appendix 3. Further background information on ex ante calculation of emission reductions

Calculation steps for the fNRB calculation

Step 1: Estimation of renewable biomass (RB) in the country of Kenya as per equation (6) of the fNRB tool

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other}))$$ Equation (6)

Where:

$MAI_{forest,i}$	=	Mean Annual Increment of woody biomass growth per hectare in sub-category *i* of forest areas (t/ha/yr)
$MAI_{other,i}$	=	Mean Annual Increment of woody biomass growth per hectare in sub-category *i* of other wooded land areas (t/ha/yr)
$F_{forest,i}$	=	Extent of forest in sub-category *i* (ha)[4]
$F_{other,i}$	=	Extent of other wooded land in sub-category *i* (ha)[4]
P_{forest}	=	Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (ha)[5]
P_{other}	=	Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas (ha)[5]
i	=	Sub-category i of forest areas and other wooded land areas

Parameter for step 1

Input parameter	Value	Data source
Extent of forest and other wooded land in 2015 Forest Forest (excluding plantations) Other wooded land Other land	(in ha) 4,413,000 4,193,000 9,365,000 43,136,000	Global Forest Resources Assessment 2015, Country Report Kenya, page 9, 1.4 Data (Table 1a) Global Forest Resources Assessment 2015, Country Report Kenya, page 14, 2.4 Data (Table 2a) (for plantations)
Deforestation rate/year Forest Other wooded land Other land	(in ha) -21,240 -26,800 39,240 (gain)	Calculated based on forest/other wooded land figures from 1990 and 2015 Global Forest Resources Assessment 2015, Country Report Kenya, page 9, 1.4 Data (Table 1a)
Extent of forest and other wooded land in 2018 Forest Other wooded land Other land	(in ha) 4,129,280 9,284,600 43,253,720	Calculated
MAI Forest Other wooded land	(in m3/ha/year) 0.793 0.25	GTZ Eastern Africa Online Resource Base[26] For forest, average value from closed forest (1.3 m3/ha/year), woodlands (0.64 m3/ha/year); and bushlands (0.44 m3/ha/year) since all are deemed to have a canopy cover of at least 40%, hence are considered as forest as per Kenya's DNA forest definition[27] For other wooded lands, the value for wooded grasslands (0.25 m3/ha/year) is used. Wooded grasslands are described as areas with a 10-40% woody vegetation cover, hence predominantly fall under 'other wooded land' as per Kenya's DNA forest definition.

[26] https://energypedia.info/wiki/Biomass_Energy_Resources_in_Kenya

[27] https://cdm.unfccc.int/DNA/index.html

Other land	0.08	For other land, a MAI of 0.08 m3/ha/year has been assumed for **100%** of other land. To take 100% of other lands is conservative, since only a certain proportion of other lands provide supply of woody biomass. The MAI of 0.008 m3/ha/year has been used and is the one for grasslands.
Wood density	0.581 t/m^3	FAO[28] Average density of 282 different tree species for tropical Africa
Protected areas Protected areas within forest areas Protected areas within other wooded land areas Protected areas within other land areas	(in ha) 2,705,513 1,740,336 8,580,056	Protected Planet[29] A complete dataset with all the protected areas has been downloaded from the website. Each of the polygons available on Protected Planet has been imported to Google Earth and a photo-interpretation of the canopy cover has been conducted. The polygons have been classified as protected areas within forest areas if the canopy cover was clearly above 30% and into protected areas within other wooded land areas if the canopy cover was between 5 to 30%. Those protected areas for which the canopy cover was less than 5% have been discarded and are not considered as protected areas within forest or other wooded land areas. See excel spreadsheet 'Protected land areas of Kenya from Protected Planet Website' and Google Earth screenshots/Shapefiles

The Global Forest Resources Assessment 2015, Country Report Kenya for Extent of forest, other wooded land and other land is being considered to be the most reliable, accurate and updated data source. It is in line with the fNRB tool referring to the Global Forest Resources Assessment 2015 as one of the data sources.

The extent of forest and other wooded land from Global Forest Resources Assessment 2015, Country Report Kenya refer to 2015 which is more than 3 years prior to submission of this CPA-DD. Therefore, the 2015 values have been further extrapolated taking into account the historical loss of forest and other wooded land between 1990 and 2015 as indicated in the Global Forest Resources Assessment 2015, Country Report Kenya. The extrapolated 2018 values were used in the calculation of renewable biomass. Applying the values projected for 2018 in the NRB calculation is considered to be justified since it can be assumed that the historic deforestation from

[28] http://www.fao.org/3/W4095E/w4095e0c.htm

[29] https://protectedplanet.net/country/KE

1990 to 2015 continues to happen in future, in particular as Kenya's population continues to grow. Plantations are discounted from the forest area since products and by-products from plantations are assumed not to be available for meeting thermal energy uses.
The fNRB tool in footnote 4 requires including woody biomass from other land areas that do not fall under the category of forest areas and other wooded land areas. Though only one portion of other lands provide some woody biomass, it was conservatively assumed that 100% of other lands contribute to some woody biomass supply.

The mean annual increment (MAI) data is sourced from GTZ Eastern Africa Online Resource Base. Those values, since specific for Kenya, are the most appropriate and updated ones after having carried out an extensive literature research. It is in line with the fNRB tool which allows amongst other values from national studies or official statistics. For forests, average value from closed forest (1.3 m3/ha/year), woodlands (0.64 m3/ha/year) and bushlands (0.44 m3/ha/year) has been used since all are considered to have a canopy cover of at least 40%, hence are considered as forest as per Kenya's DNA forest definition.[30] For other wooded lands the value for wooded grasslands (0.25 m3/ha/year) is used. Wooded grasslands are described as areas with a 10-40% woody vegetation cover, hence predominantly fall under 'other wooded land' as per Kenya's DNA forest definition. For other lands, the MAI for grasslands being 0.08 m3/ha/year has been applied.

In terms of protected areas, data from the most comprehensive and updated dataset, namely the Protected Planet database has been used. Protected Planet database is managed by the United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC) with support from IUCN and its World Commission on Protected Areas (WCPA).[31] This is in line with the fNRB tool which allows amongst other values from national studies or official statistics. The database lists 411 different protected areas all over Kenya.

The CPA implementer downloaded the complete dataset (in excel format) with all the protected areas from the Protected Planet website. Each of the polygons available on Protected Planet website has been imported to Google Earth and a photo-interpretation of the canopy cover has been conducted[32]. The polygons have been conservatively classified as protected areas within forest areas if the canopy cover was clearly above 30%[33] and into protected areas within other wooded land areas if the canopy cover was between 5 to 30%. Those protected areas for which the canopy cover was less than 5% and those ones for which no photo-interpretation has been conducted anymore (due to very small size), have been discounted from other land areas.

Step 2: Estimation of consumption of woody biomass (H) in the country of Kenya as per equation (4) of the fNRB tool

H is calculated using equation (4), accounting for all consumptions within the country/region (not only woodfuel but also timber and industrial consumption).

$$H = HW_{region} \times N_{region} + TI_{region} \qquad \text{Equation (4)}$$

Where:

HW_{region}	=	Average household woodfuel consumption, including fuelwood and charcoal as per paragraph 15 below (t/yr/household)

[30] https://cdm.unfccc.int/DNA/index.html

[31] https://protectedplanet.net/c/about

[32] Screenshots and shapefiles used in this exercise have been submitted to the validating DOE.

[33] As per the forest definition given by the Kenyan DNA, the minimum canopy cover has to be 30%.

TI_{region}	=	Non-domestic wood consumption for energy applications (e.g. commercial, industrial or institutional uses of wood in ovens, boilers etc.) and all wood consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or land areas in the country/region for which the estimate of fNRB is to be made (t/yr)[1]
N_{region}	=	Number of households consuming woodfuel for thermal applications within the country/region (households)[1]

Parameter for step 2

Input parameter	Value	Data source
$HW_{country}$ (average per capita woodfuel consumption across the total population in Kenya) Urban areas Rural areas	(in t/person/year) 1.171 0.627	WISDOM report 'Analysis of woodfuel supply, demand and sustainability in Kenya', Table A1.2 KIHBS 2015/16, Table 3.18
$N_{country}$ (Total population in 2017 in Kenya)	(in million people) 49.699862	World Bank, https://data.worldbank.org/country/kenya?view=chart
Annual population growth	2.49%	UN data[34]
$N_{country}$ (Total population in 2018 in Kenya)	(in million people) 50.937389	Calculated
Proportion urban vs. rural population in 2018 Urban population Rural population	 26.57% 73.43%	Worldbank data[35]

34 https://population.un.org/wpp/Download/Standard/Population/

35 https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=KE

Equation (4) of the fNRB tool stipulates that the average household woodfuel consumption is multiplied with the number of households consuming woodfuel for thermal applications within the country. Since most of the available and reliable data is based on per capita fuelwood consumption data. The total consumption of woody biomass has been calculated by multiplying the average per capita fuelwood consumption by the total population figure in 2017. The annual fuelwood consumption per capita has been calculated from values stated in the WISDOM report 'Analysis of woodfuel supply, demand and sustainability in Kenya'.

The total population in 2017 has been calculated taking into account the published World Bank population data from 2017, as well as an annual population growth of 2.49%. 2017 figures have been extrapolated to 2018 taking into account the population growth. This is in line with the fNRB tool, section 5, table 3.

Products and by-products from forests and non-forest areas not available for meeting thermal uses as per AMS-I.E and AMS-II.G are not accounted for in the estimation of the consumption for biomass, hence $TI_{project}$ is assumed to be zero. This is in line with footnote 3 of the fNRB tool, which gives PPs the possibility either to include or exclude forest and non-forest areas for which products or by-products are not available for meeting thermal uses. Since forest plantation areas are excluded, the products and by-products of these areas are also not accounted for in the estimation of consumption of biomass.

Step 3: Estimation of quantity of non-renewable biomass (t/year) as per equation (2) of the fNRB tool

$$NRB = H - RB \qquad \text{Equation (2)}$$

Where:

H	=	Total annual consumption of wood in the absence of the project activity, determined as per section 4.1 below (t/yr)

This step calculates the quantity of non-renewable biomass (t/year) (NRB) by subtracting the renewable biomass estimated in step 1 from the total consumption of woody biomass estimated in step 2. No further input parameters are needed under this step.

NRB = 39,322,643– 3,364,674
NRB = 35,957,970

Step 4: Estimation of fraction of woody biomass that can be established as non-renewable (fNRB) as per equation (1) of the fNRB tool

$$fNRB = \frac{NRB}{NRB + RB} \qquad \text{Equation (1)}$$

This step calculates the fraction of woody biomass that can be established as non-renewable (fNRB). The non-renewable biomass calculated in step 3 is divided by the sum of non-renewable biomass and renewable biomass calculated in step 1. No further input parameters are needed under this step.

fNRB = 35,957,970/ (35,957,970 + 3,364,674)
fNRB = **91.4%**

The calculated fNRB is slightly below the national default value of 92%[36] which expired on September 18, 2017.

Appendix 4. Further background information on monitoring plan

Not applicable

Appendix 5. Summary report of comments received from local stakeholders

Not applicable

Appendix 6. Summary of post-registration changes

The following corrections have been carried out in the CPA-DD, v.3.2, dated 09/06/2020:

a) The efficiency value in section A.3 (as well as in all other relevant sections of the VPA-DD) has been revised now referring to the thermal efficiency value including simmering, i.e. taking into account both high power and low power. The thermal efficiency value is taken from manufacturer's specifications based on Water Boiling Tests carried out by the manufacturer BURN in its Design Lab following WBT protocol 4.2.3. and complying with a 95/10 confidence/precision level. Firepower and Boil Time have been updated accordingly.
b) The variance has been corrected in section B.5.2 in order to be in line with the standard deviation result found in the WBTs. This change had an implication on the initial sample size, hence text related to t-distribution and sample size were revised in the section B.5.2.
c) In section B.5.2, it has been further clarified that the 47 for the parameter $\boldsymbol{R_{y,usage}}$ refers to the estimated sample size.
d) Emission reduction figure has been amended in all relevant sections of the CPA-DD as a result of the change of the thermal efficiency figure. Cover page, sections, A.1, B.4.3 and B.4.4 have been updated.
e) Version/Date of CPA-DD have been updated.

[36] https://cdm.unfccc.int/DNA/fNRB/index.html

Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	20 October 2017	Editorial revision to remove appendix "Applicability of methodologies and standardized baselines" from the main part of the form which had been mistakenly kept in the previous version.
08.0	28 June 2017	Revision to: • Remove appendix "Applicability of methodologies and standardized baselines" as the appendix is not relevant at the CPA level; • Make editorial improvement.
07.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and PoA-DD forms; • Make editorial improvement.
06.0	24 May 2017	Revision to: • Ensure consistency with the "Standard: CDM project standard for programme of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Component project activity design document form for small-scale component project activities" (CDM-SSC-CPA-DD-FORM); • Make editorial improvement.
05.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
04.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
03.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the component project activity design document form for CDM component project activities (these instructions supersede the "Guidelines for completing the component project activity design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a CPA implementer and/or responsible person/ entity for completing the CDM-CPA-DD-FORM in A.13. and Appendix 1; • Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and Appendix 6;

Version	*Date*	*Description*
		• Change the reference number from F-CDM-CPA-DD to CDM-CPA-DD-FORM; • Make editorial improvement.
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the component project activity design document form" (EB 66, Annex 16).
01.0	27 July 2007	EB 33, Annex 42 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
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