



**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**

<b>Title of the CPA</b>	<b>Malawi Biomass Energy Conservation Programme CPA 8</b>
<b>Scale of the CPA</b>	<input type="checkbox"/> Large-scale <input checked="" type="checkbox"/> Small-scale
<b>Version number of the CPA-DD</b>	2.4
<b>Completion date of the CPA-DD</b>	08 / 07 / 2020
<b>Title and UNFCCC reference number of the registered CDM PoA</b>	PoA 10182 Biomass Energy Conservation Programme
<b>Title and reference number of the corresponding generic CPA</b>	Biomass Energy Conservation Programme CPA
<b>Coordinating/managing entity</b>	Hestian Innovation Ltd.
<b>Host Party</b>	Republic of Malawi
<b>Applied methodologies and standardized baselines</b>	AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0).
<b>Sectoral scopes</b>	Scope Number 3 – Energy Demand
<b>Estimated amount of annual average GHG emission reductions</b>	38,778 t CO <sub>2</sub>

## **SECTION A. Description of component project activity (CPA)**

### **A.1. Purpose and general description of CPA**

The CPA aims to initially disseminate approximately 21 106 improved cookstoves (i.e. the technology) that are more efficient and use less wood for household cooking and heating than the traditional stoves; and to promote improved kitchen and firewood management practices e.g. use of less firewood, use of dry firewood, using a pot lid while cooking and soaking legumes before cooking (i.e. practices) to households in all three Regions of Malawi. CPA stoves are assigned unique serial numbers to be etched into each stove, which are entered into the PoA database and stored electronically, which allows for (i) tracing of when and where the stove was produced for quality assurance and (ii) verifying to which CPA each particular stove belongs to avoid double -counting.

Prior to the implementation of the CPA cooking and water heating services were ensured using traditional three stone open fire or other inefficient stoves, which has very low default efficiency of 10%.

The improved technology and practices are intended to replace less efficient technologies and practices and result in biomass conservation and a reduction of greenhouse gas emissions into the atmosphere from the burning of solid biomass.

Ancillary benefits include reduced smoke during cooking, which reduces exposure to health damaging pollutants and reduced time and effort procuring woodfuel.<sup>1</sup> The stoves are attractive to end-users and can result in quicker cooking times. The stoves are locally made using local materials wherever possible, resulting in local income generation and the acquisition of new skills for local people.

The coordinating/managing entity confirms that the CPA is neither registered as a CDM project activity nor included in another registered PoA.

### **A.2. Location of CPA**

The CPA will be implemented in the Republic of Malawi (13.30° South of Equator, 34.00° East of Greenwich Meridian)<sup>2</sup>, a landlocked country which shares its northwest border with the Republic of Zambia, northeast border with the United Republic of Tanzania, and its borders at east, south and west with the Republic of Mozambique.

Local producers and distributors were identified during stakeholder consultations which began in 2008 and are continuous. In each aspect of the project, the project implementer seeks to utilise existing community networks and to bring benefits to all involved.

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<sup>1</sup> Woodfuel is used to mean all fuels originating from woody biomass, including charcoal, in distinction from firewood or fuelwood, which are understood to mean wood in its original composition.

<sup>2</sup> <http://www.greenwichmeantime.com/time-zone/africa/malawi/map-malawi/>



Pic. 1. Map of Malawi.

### A.3. Technologies/measures

Malawi fits into the criteria of an LDC and where biomass meets 93% of household and industrial energy needs.<sup>3</sup> Current solid biomass supply does not adequately meet demand. Further, Malawi is vulnerable to other challenges which affect its energy sector such as low purchasing power, adverse impacts of Indoor Air Pollution on women and children, and land degradation cause from overharvesting of wood. The baseline scenario is the same as the scenario existing prior to the implementation of the CPA.

The improved cook stove for the most part replaces a three stone fire, which is omnipresent in rural and peri-urban Malawi.<sup>4</sup> Time to cooking a typical meal in Malawi vary, with nsima corn porridge cooked in boiled water being the most common staple taking about 25 to 30 minutes to boil from a cold start, which the accompanied vegetable relish usually only taking a few minutes. Beans can be cooked over long periods, but cooking times can be shortened with improved cooking practices such as keeping a lid on a pot and soaking beans overnight before cooking.

Expected project stove's daily firewood consumption for cooking and heating purposes per household is 4.488 kg / household / day or 1.638 tonnes per household per year (as indicated in PoA DD based on the kitchen performance test conducted in 2009).

The Chitetezo, i.e. the stove disseminated in this CPA, is designed to cater for many size pots and pans ranging small pots to fry relish to large pots to cook nsima.

<sup>3</sup> Wood (biomass) is the dominant household fuel accounting for 98% in rural and 53% in urban areas on average. Rural areas tend to be more dependent on wood, and urban areas on charcoal. (Source: Millennium Challenge Corporation Report 2010, cited in Malawi State of Environment and Outlook Report 2010).

<sup>4</sup> The National Energy Policy (of Malawi), Department of Energy, 2003 cites that 91% of rural households use a 3-stone fire for domestic cooking and heating.

Based on the estimated emissions reductions per household and the threshold for small-scale projects, it is estimated that each CPA can include 21,106 stoves. The actual number of stoves disseminated within CPA will depend on the monitored values of fuel consumption and usage rate and will be limited to the amount allowing meeting small-scale threshold of maximum annual energy savings of 180 GWh.

Malawi has a national target of reaching 2 million households by 2020 and this CPA aims to play a part in this ambitious target. Once one CPA reached its capacity a new CPA will begin until demand for stoves is exhausted within the time frame of the PoA. Each stove will have its unique serial number and will be clearly assigned to the particular CPA.

The use of efficient stoves is one of the key components of Malawi's Biomass Energy Strategy; and the positive effects of the use of improved cookstoves on the physical environment and economy of Malawi contributes to the realisation of goals and objectives outlined in Malawi's Poverty Reduction Strategy Paper, Growth and Development Strategy, Biodiversity Strategy and Action Plan, and the National Environmental Policy. In addition, in mid-2012 Malawi signed on as a national partner to the Global Alliance for Clean Cookstoves and on January 10, 2013, the former Head of State announced a target of 2 million clean and efficient cookstoves in the country by 2020.

The cookstove model which is the focus of initial dissemination is a Ceramic Stove called the *Chitetezo Mbaula* in Malawi and *Canarumwe* in Rwanda. This stove can be used as a portable stove or can be fixed, and has a laboratory test efficiency of 30.6%<sup>5</sup> (more than three times the default 10% efficiency of the baseline three stone and unimproved cookstoves) which results in reduced fuel consumption by improved combustion, improved heat transfer, raising the cooking pot to the hottest point above the flame, and improved heat retention. The Chitetezo Mbaula has an average lifespan of 47 months,<sup>6</sup> can be used for various pot sizes, its efficiency does not significantly differ in aging stoves. The lifespan is shorter than the crediting period so the emission reductions will be generated across the crediting period as more stoves will be gradually added to the CPA.

The cook stoves are manufactured from clay. First, the clay is prepared in a specially dig pit covered with a plastic sheet up to the top sides by daily watering and stirring. After around 14 days the clay is cured and ready for making stoves. Then, stoves are manufactured in accordance with the specially designed manuals and ensuring the application of quality control tools. When stoves have been dried for at least 2 weeks, they are fired in special kilns.

Stoves are distributed by direct sales to end-users, retailers or agents of the project. End user information is collected and contained in emission reduction contract. This information is collated into an electronic database from which project monitoring can be conducted.

This CPA will initially focus on low-income rural and peri-urban households using non-renewable biomass energy on traditional/unimproved/low-efficiency stoves. The Ceramic Stove is produced at a local level using locally available materials, thereby creating employment in a 'green' industry.

This CPA's Selected Methodology is AMS-II.G. (Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass) Version 06 under Sectoral Scope 3 Energy Demand.

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<sup>5</sup> Tests were carried out in August 2012 by the Regional Stove Testing Centre, Centre for Research in Energy and Energy Conservation (CREEC), at College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda (creec@tech.mak.ac.ug).

<sup>6</sup> Estimates are based on verification report for GS613, a Gold Standard project that has been developed in Malawi. The Verification Report is for the period 02/10/2012 to 01/10/2013 (both days inclusive). Lifespan estimated at 47 months (page 19 of 118). Gold Standard Verification Report, - 4th Periodic Verification— Hestian Innovation Ltd. Integrated Biomass Energy Conservation Project, Malawi, GS Ref. No: GS613, Monitoring Period: 2012-10-02 to 2013-10-01 (incl. both days), Report No: 13GS08050 – 14/148, Date: 2014-12-09, TÜV NORD CERT GmbH, JI/CDM Certification Program.

**A.4. Coordinating/managing entity**

Hestian Innovation Ltd. (Hestian) is the Coordinating/managing entity (CME).

**A.5. Parties and CPA implementers**

Parties involved	CPA implementers	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Republic of Malawi	Hestian Innovation Ltd (Private)	No
Norway	Norwegian Ministry of Climate and Environment	No

**A.6. Public funding of CPA**

The PoA does not receive public funding from Parties included in Annex 1.

**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. There is no similar registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CPA.

A Letter of Approval and Authorisation from DNA of the Republic of Malawi dated April 1, 2015, which explicitly states that an EIA is not required, has been issued to the CME.

06/04/2018 is the start date of the CPA, which is the day of the first stove sale under the CPA , and after the PoA registration date, which is 13/08/2015.

**A.8. Debundling**

The CPA is exempted from de-bundling as justified in Section B.2 eligibility criterion L of the registered PoA-DD.

## SECTION B. Application of methodologies and standardized baselines

### B.1. References to methodologies and standardized baselines

This CPA will apply the methodology referenced in the PoA-DD: *AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0)*.

As prescribed by the Methodology, the following documents are also referenced for project development and implementation:

- General guidelines for SSC CDM methodologies Version 20.0
- Standard for sampling and surveys for CDM project activities and programme of activities Version 04.1
- Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Version 08
- Guidelines on the demonstration of Additionality of small-scale project activities Version 09.0.
- Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities V 3.0.

CPA meets the applicability conditions of the applied methodology *AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0)*.

The CPA reduces the amount of greenhouse gases (GHGs) emitted from fuelwood by introducing widespread use of improved high efficiency biomass fired cook-stoves which replace existing less efficient devices.

The methodology is applicable to single pot or multi pot portable or in-situ cook stoves with rated efficiency of at least 20 per cent. The efficiency of the project device is 30.6% (efficiency based on water boiling test (WBT)).

Non-renewable biomass has been used in the project region (Malawi) since 31 December 1989. This is evidenced by the widespread documentation of more biomass being consumed than is sustainably harvested, and is specifically outlined in an information note for the CDM which estimates fraction of non-renewable biomass for Least Developed Countries.<sup>7</sup> Detailed information is presented in Section B.3 of the registered PoA DD.

The aggregate energy savings of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input as required by the applicability criteria of the applied methodology.

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, i.e. the size of each unit under 750 kW installed capacity or under 3,000 MWh of energy savings per year or 3,000 tonnes of emission reductions per year, are defined as automatically additional for CPA sizes up to and including the small-scale CDM thresholds.

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<sup>7</sup> CDM SSC WG 35 Meeting Report, Annex 20

Based on the ex-ante estimations of emission reductions per household using a project stove, calculated as per equations detailed in B.6.3, the project technologies meet these criteria: each unit can achieve about 2 tonnes of emission reductions per year on average.

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

	Source	GHGs	Included?	Justification/Explanation
<b>Baseline scenario</b>	Combustion of non-renewable woody biomass for cooking (traditional 3 stone open fire)	CO <sub>2</sub>	Yes	Major source of emissions.
		CH <sub>4</sub>	No	Minor source of emissions. Not required by methodology.
		N <sub>2</sub> O	No	Minor source of emissions. Not required by methodology.
<b>Project scenario</b>	Combustion of non-renewable woody biomass for cooking (fuel efficient stove)	CO <sub>2</sub>	Yes	Major source of emissions.
		CH <sub>4</sub>	No	Minor source of emissions. Not required by methodology.
		N <sub>2</sub> O	No	Minor source of emissions. Not required by methodology.

This CPA is located within the geographical boundary of Malawi which lies within the geographic boundary of the proposed PoA.

## B.3. Establishment and description of baseline scenario

For this CPA the baseline scenario is defined as “the use of fossil fuels for meeting thermal energy needs” in the absence of the project activity. In this CPA, in the absence of project activity, the three stone fire is the main “stove” used to meet household cooking needs.

In Malawi more than 9 out of 10 rural households use a three stone fire to meet their basic energy needs. This was documented in the National Energy Policy of 2003<sup>8</sup> and has since been collaborated by various baseline studies such as the baseline survey carried out by the CME in 2009. Households using firewood as their primary fuel are the targeted population of this PoA in Malawi.

## B.4. Estimation of emission reductions

### B.4.1. Explanation of methodological choices

This CPAs makes the following applications based on the methodology:

- Use of an adjustment factor of 0.95 to account for leakages, negating the need for leakage surveys,
- Use of default national values approved by the CDM Board; and
- Monitoring plan outlined in B.7.2 of PoA DD.

Equations 1, 2 and 6 from AMS-II.G v.6.0 are used in calculating of emission reductions in accordance with the PoA as detailed in B.4.3 below.

<sup>8</sup> The National Energy Policy, Department of Energy, 2003 cites that 91% of rural households use a 3-stone fire for domestic cooking and heating.

## B.4.2. Data and parameters fixed ex ante

<b>Data / Parameter</b>	<b>f<sub>NRB,y</sub></b>
<b>Unit</b>	%
<b>Description</b>	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
<b>Source of data</b>	Default values of fraction of non-renewable biomass approved by CDM EB and accepted by DNA as indicated at UNFCCC website <sup>9</sup>
<b>Value(s) applied</b>	0.81
<b>Choice of data or Measurement methods and procedures</b>	Default country specific value. The parameter value is fixed ex ante, and is to be re-assessed and fixed at the beginning of each crediting period.
<b>Purpose of data</b>	Calculation of baseline emissions / emission reductions
<b>Additional comment</b>	

Default values specified in the methodology AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0) are not included in the compilation.

## B.4.3. Ex ante calculation of emission reductions

Emission reductions per project technology are calculated as follows, using Equation 2 of the methodology:

$$ER_{y,i} = \sum_{a=1}^{a=y} B_{y,savings,i,a} \times N_{y,i,a} \times \left( \frac{\mu}{365} \right) \times F_{NRB,y} \times NCV_{biomass} \times EF_{projectedfossilfuel} - LE_y$$

where:

ER <sub>y</sub>	– emission reductions, t CO <sub>2e</sub> ,
'a'	– the indices for the age (in years) of the cook stoves that are operating in the year y of the crediting period.
B <sub>y,savings,i,a</sub>	– annual quantity of woody biomass that is saved in tonnes per cook stove device of type i and age a in year y
N <sub>yia</sub>	– number of project devices of type i and age a that are operating in year y
μ <sub>y,i</sub>	– number of days of utilization of the project device during the year y
f <sub>NRB,y</sub>	– fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass

<sup>9</sup>



- NCV<sub>biomass</sub> – net calorific value of the non-renewable biomass that is substituted
- EF<sub>projected\_fossilfuel</sub> – emission factor for the substitution of non-renewable biomass by similar consumers
- LE<sub>y</sub> – Leakage adjustment factor for period y

B<sub>y, savings, i, a</sub> is calculated using Equation 6 of the methodology AMS-II.G Version 6.0:

$$B_{y, savings, i, a} = B_{y=1, new, i, survey} \times ( (\eta_{new, i, a=1} \times \Delta\eta_{y, i, a} / \eta_{old}) - 1 )$$

and

$$\Delta\eta_{y, i, a} = ( \eta_{new, i, a} / \eta_{new, i, a=1} )$$

where

- B<sub>y=1, new, i, survey</sub> – annual quantity of woody biomass used by project devices in tonnes per device of type i
- η<sub>new, i, a</sub> – the thermal efficiency of the device 'i' at age 'a' determined using the water boiling test
- η<sub>new, i, a=1</sub> – the thermal efficiency of the device at its first year of operation
- Δη<sub>y, i, a</sub> – factor to consider the efficiency loss of the project device type i due to its aging at the year y
- η<sub>old</sub> – efficiency of the device being replaced

The annual emission reductions per one stove are estimated to be 2.083 tCO<sub>2</sub>e/yr. Assuming expected operation of 21 106 stoves during the year total annual emission reductions will be 41 761 tCO<sub>2</sub>e/yr. In year 1, stoves are assumed to be distributed gradually over 12 months and therefore emission reductions will be 20 880 tCO<sub>2</sub>e.

#### B.4.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (tCO <sub>2</sub> e)	Project emissions (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	Emission reductions (tCO <sub>2</sub> e)
Year 1	39,117	17,138	1,099	20,880
Year 2	78,234	34,276	2,198	41,761
Year 3	78,234	34,276	2,198	41,761
Year 4	78,234	34,276	2,198	41,761
Year 5	78,234	34,276	2,198	41,761
Year 6	78,234	34,276	2,198	41,761
Year 7	78,234	34,276	2,198	41,761
<b>Total</b>	508,523	222,792	14,287	271,444
<b>Total number of crediting years</b>	7 years			
<b>Annual average over the crediting period</b>	72,646	31,827	2,041	38,778

**B.5. Monitoring plan****B.5.1. Data and parameters to be monitored**

<b>Data / Parameter</b>	$B_{y=1,new,i,survey}$
<b>Unit</b>	t/HH/yr
<b>Description</b>	Annual quantity of woody biomass used by project devices in tonnes per device of type $i$
<b>Source of data</b>	Sample surveys-Kitchen performance tests
<b>Value(s) applied</b>	For the purposes of calculating ex-ante emission reductions, assumption is 1.638 tonnes of woody biomass per year per household in Malawi
<b>Measurement methods and procedures</b>	<p>Estimated using Kitchen performance tests through a sample survey to be conducted together with surveys for proportion of operational stoves and the proportion of discontinued use of baseline stoves (the sample size of which have been assessed to avoid bias and to ensure reliability).</p> <p>For <math>B_{y=1,new,i,survey}</math>, surveyed households would not include those that are identified as either (i) continue to use baseline technology through response to the survey or through observation by enumerator or (ii) no longer use the improved cookstoves.</p> <p>As per paragraph 22 on page 11 of the methodology AS-II.G V6.0, as the baseline device is a three stone fire, the use of data loggers to record the continued operation of baseline devices is not practical; hence, surveys as described above are conducted.</p>
<b>Monitoring frequency</b>	Monitored in the first year of introduction of the devices (e.g. during the first year of the crediting period, $y=1$ ).
<b>QA/QC procedures</b>	Use of calibrated measurement equipment.
<b>Purpose of data</b>	Calculation of emissions reductions
<b>Additional comment</b>	

<b>Data / Parameter</b>	$N_{y,i,a}$
<b>Unit</b>	Number
<b>Description</b>	Number of project devices of type $i$ and age $a$ that are operating in year $y$
<b>Source of data</b>	Monitoring records (total sales records database), usage and monitoring survey
<b>Value(s) applied</b>	For the purposes of calculating ex-ante emission reductions, assumption is 21 106
<b>Measurement methods and procedures</b>	The installation date and recipient/location of each device shall be tracked individually, and emissions reductions shall be considered from the date of commissioning of each device. Monitoring shall consist of checking all devices or a representative sample thereof to determine if they are still operating (via estimation of Proportion of ICS still in operation as described in section section D.7.2); usage rate determined via monitoring surveys will be used to adjust the number of operating stoves; those devices that have been replaced prior to and independently from the monitoring survey by an equivalent in-service device can be counted as operating.

<b>Monitoring frequency</b>	Annually.
<b>QA/QC procedures</b>	Sampling will be conducted by applying the 95/10 confidence precision for the sample size calculation.
<b>Purpose of data</b>	Calculation of baseline and project emissions / emission reductions
<b>Additional comment</b>	Replaced devices are considered operational.

<b>Data / Parameter</b>	$\mu_{y,i} / 365$
<b>Unit</b>	%
<b>Description</b>	Number of days of utilization of the project device during the year 'y'.
<b>Source of data</b>	Usage and monitoring survey
<b>Value(s) applied</b>	For the purposes of calculating ex-ante emission reductions, assumption is 365
<b>Measurement methods and procedures</b>	<p>As pre-project devices are unlikely to be totally decommissioned, surveys are to be designed to capture cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidences to determine the frequency of usage of both the project devices and baseline devices.</p> <p>According to paragraph 22 of the methodology, surveys may be conducted if the use of data loggers to record the continued operation of baseline devices is not practical, for example when the baseline device is the three stone fire. As using data loggers is not practical due to high number of ICS distributed within PoA and the baseline device is the three stone fire, the use of surveys is justified.</p> <p>Discontinued use of baseline technology is predicted to be the larger proportion than continued use as explained in Section B.7.2 below.</p>
<b>Monitoring frequency</b>	Annually.
<b>QA/QC procedures</b>	Sampling will be conducted by applying the 95/10 confidence precision for the sample size calculation.
<b>Purpose of data</b>	Calculation of baseline and project emissions / emission reductions
<b>Additional comment</b>	$N_{y,i,a}$ is to be discounted for discontinued use of baseline technology confirmed through stratified random sampling, as explained in section B.7.2, Part II of the PoA-DD. The rounded-up value will be used. Replaced stoves will be considered operational.

<b>Data / Parameter</b>	$\Delta n_{y,i,a}$
<b>Unit</b>	%
<b>Description</b>	Factor to consider the efficiency loss of the project device type <i>i</i> due to its aging at the year <i>y</i>
<b>Source of data</b>	Calculated based on the survey results – simple random sample using Water Boiling Test protocol
<b>Value(s) applied</b>	For the purposes of calculating ex-ante emission reductions, assumption is 81.7%. Assumed that the actual thermal efficiency in the field is 25%, while laboratory thermal efficiency tests estimate an efficiency of over 30.6%.
<b>Measurement methods and procedures</b>	As per the WBT protocol.

<b>Monitoring frequency</b>	Water Boiling Tests to be conducted in the first batch of stoves thereafter monitoring will determine the thermal efficiency of the devices installed at the first year of the crediting period, and the efficiency loss of this population will be used to correct the initial efficiency of the population of devices installed later on.
<b>QA/QC procedures</b>	Conducted by a capable person with thorough understanding of internationally recognised WBT protocols, updated by the Partnership for Clean Indoor Air and the Global Alliance for Clean Cookstoves. The protocol is continuously revised. The most recent version is WBT Protocol 4.2.3 released March 19, 2014 and WBT spreadsheet 4.2.4 <sup>10</sup> .  Use of calibrated equipment
<b>Purpose of data</b>	Calculation of baseline and project emissions / emissions reduction
<b>Additional comment</b>	

<b>Data / Parameter</b>	$n_{new,i,a}$
<b>Unit</b>	Fraction
<b>Description</b>	Thermal efficiency of device of type i being deployed as part of the project activity with the age a
<b>Source of data</b>	Survey – simple random sample using Water Boiling Test protocol
<b>Value(s) applied</b>	For the purposes of calculating ex-ante emission reductions, assumption is actual thermal efficiency in the field is 25% (although laboratory thermal efficiency tests estimate an efficiency of over 30.6%).
<b>Measurement methods and procedures</b>	As per the WBT protocol.
<b>Monitoring frequency</b>	Water Boiling Tests to be conducted in the first batch of stoves thereafter monitoring will determine the thermal efficiency of the devices installed at the first year of the crediting period, and the efficiency loss of this population will be used to correct the initial efficiency of the population of devices installed later on.
<b>QA/QC procedures</b>	Conducted by a capable person with thorough understanding of internationally recognised WBT protocols, updated by the Partnership for Clean Indoor Air and the Global Alliance for Clean Cookstoves. The protocol is continuously revised. The most recent version is WBT Protocol 4.2.3 released March 19, 2014.
<b>Purpose of data</b>	Calculation of baseline and project emissions / emission reduction
<b>Additional comment</b>	

### B.5.2. Sampling plan

The monitoring plan is designed to monitor the parameters (listed in Section B.7.1), which are required for calculation of the actual GHG emission reduction achieved by the CPA using *ex post* sampling survey.

The share of operating stoves and their efficiency will be determined based on sampling procedures as outlined already in Section B.3. Part I of the PoA-DD. The CME will be responsible for conducting the sampling surveys and maintaining a database with all operating

<sup>10</sup> WBT Protocol, <https://www.cleancookingalliance.org/technology-and-fuels/testing/protocols.html>

stoves.

No monitoring for leakage through competitive uses of biomass is required, as the parameter *ER* calculations are discounted for that by deducting 5% (by factoring the estimated ERs by 95%).

All technical staff responsible for installation and maintenance of the stoves will be trained in terms of the understanding the requirements of CDM on the monitoring system. The technical, operational and maintenance trainings provided for the personnel will be described in each monitoring report.

The monitoring plan shall ensure that only one ICS model is used in each CPA. The type of stoves will be confirmed at the time of purchase and the CME will ensure that it is added to the corresponding CPA. During monitoring, the stoves model data in the database will be compared against sales documents. Erroneously included stoves will be excluded from emission reduction calculations.

The monitoring plan will further ensure compliance with the requirement of point 37 (a) and (b) of AMS-II.G. ver. 06.0.

1. The replaced low efficiency devices are disposed of and not used within the boundary or within the region.
2. If the baseline stoves continue to be used, monitoring shall ensure that the fuelwood consumption of those stoves is excluded from the  $B_{old}$

The disposal or continued use of old devices will be confirmed through stratified sampling as described in Part I, Section B.3. of this PoA-DD. In case old devices are used, total emission reductions will be discounted following the below approach:

1. The share of households where old devices are used will be determined based on stratified sampling.
2. The amount of emission reductions calculated for the share of households where old stoves are used will be reduced by 50 % under the assumption that the old stove and the ICS are used 50% of the time each.

## Sampling Plan

According to the registered PoA DD, due to the large number of improved cook stoves (ICS) envisaged to be distributed as part of the CPAs to be included in the PoA, it is not economically feasible to monitor each individual ICS unit distributed.

Therefore, representative sampling has been undertaken as part of a PoA-wide Sampling Plan that is designed in line with the requirements of AMS II.G v6.0 and the CDM Guideline "Sampling and surveys for CDM project activities and programmes of activities", Version 03.0. The parameters are estimated across all CPAs.

Monitored Parameter:	Description of Parameter:
$N_{y,i,a}$	Number of project devices of type <i>i</i> and age <i>a</i> that are operating in year <i>y</i> is adjusted using the Proportion of ICS still in operation estimated via usage and monitoring surveys
$\mu_{y,i}/365$	The relative share of usage of the project ICS if a baseline (replaced) stove is still being used in addition to ICS (hereafter called "retention use of ICS")
$\eta_{new,y,i}$	Thermal Efficiency of operational ICS
$B_{y=1,new,i,survey}$	Annual quantity of woody biomass used by project devices in tonnes per device of type <i>i</i> , determined in the first year of the introduction of the devices

Of the four parameters to be monitored, two are proportions/percentages ( $N_{y,i,a}$ ) and ( $\mu_{y,i}/365$ ) and the other two are mean values ( $\eta_{new,y,i}$ ) and ( $B_{y=1,new,i,survey}$ ).

### B.5.3. Other elements of monitoring plan

#### Data Collection and Management

The CME is responsible for collecting the monitoring data in accordance with the requirements from the CDM EB on monitoring and verification to ensure that the emission reductions are monitored recorded and reported accurately. The CME is responsible for verification of the measurement, data collection and the calculation of the emissions reductions.

An electronic record keeping system is operated and maintained by the coordinating managing entity for each CPA under the PoA, which contains at least the following information:

- Type of appliance (ICS type) deployed
- Serial number (Stove-ID) of device
- CPA number
- Delivery date of appliance<sup>11</sup>
- User details (name, address and telephone if available) will be collected for the majority of customers.<sup>12</sup>

The record keeping system will be updated as per the progress of the CPA. Data will be kept for the whole crediting period of the CPA and an additional two years.

A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or project within any other standard is in place. The serial numbers allocated to each device under the PoA allowing unique identification and tracking of the devices. Based on the serial numbers, a device can only count in one CPA. Along with the stove serial number the total sales database will include the information on the CPA it is included in.

CME will collaborate with other project developers active in the same geographic areas through national fora to ensure that any double counting risks are conservatively accounted for.

Stoves sold before the CPA starting date will only claim credits from the day after the starting date of the CPA and will be limited to a lifespan from the day of initial adoption.

Stoves that are found to be broken during the usage and monitoring surveys will not be considered at all for emission reductions and will be considered out of use.

The CME assists the CPA implementing and monitoring bodies (CPA implementers), such as Area 55 Consulting and Sunfire, to maintain and make available accurate records. The CME collates a composite electronic Total Sales Record and project implementers keep back-up paper records. The existing accounting and records system accurately tracks sales, inventories and supply and purchases. CPA implementers maintain a full electronic sales database of all household sales that

<sup>11</sup> For bulk sales the address of the retailer and delivery notes are to be made available for verification and auditing.

<sup>12</sup> Although it is difficult to track 100% of households that will eventually use the stove(s) promoted by the PoA, the CME will encourage project implementers to track as many as possible and definitely more than half. Given that (i) monitoring will be carried out at PoA level and it is envisaged that there will be multiple CPAs throughout Malawi, (ii) monitoring will be carried out annually, and (iii) effort will be made to collect information from all customers without bias; the CME believes that for monitoring purposes a sample from at least half the population can indeed be truly representative of the entire population to adopt ICS for the PoA.

take place, listed according to the sales mechanism, date, device, type etc. Sales databases are cross-checked with production records and other data to ensure consistency and accuracy.

There is no formal overarching warranty system in place for household cook-stoves, from any of the CPA implementers. Replacement within areas less than 10km away from promoter and production group may be done if stove breaks within first few weeks of use at the discretion of the stove promoter and production group<sup>13</sup>. Further than this it is too difficult to assess for ceramic stove if stove broke during transport or recklessness or fault of user.

End user information is collected through direct sales to end-users by retailers or agents of the project and is contained in warranty and/or emission reduction contract. This information is collated into an electronic database from which project monitoring can be conducted. The database and Excel records are backed up and sent to the CME for checking prior to using them as the basis for monitoring activities. Hard copies of ER contracts (and where possible scanned copies as well) and warranty are filed as additional backup and for verification purposes.

Direct sales to end-users information is collected by CPAs' agents who are issued with contract forms in advance and submit the forms to the relevant project managers.

Monitoring tasks, such as monitoring surveys, assessment of leakage and other such tasks are managed by the CPA managers who are best capable of collecting this data because they know the technology and the end-users best, with the support of the CME.

Surveys and tests are organised by CPA implementer staff with guidance from the CME, and enumerators are trained prior to conducting surveys and tests. Survey and test results are filed in paper at project implementers' offices and are analysed using Excel to compile reports. The integrity of data is constantly cross-checked with other variables to ensure consistency and avoid mistakes.

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13

The approach is an informal agreement between producers, promoters and customers. The complementary replacement stove promotes customer loyalty and helps to market the stoves locally.

**SECTION C. Start date, crediting period type and duration****C.1. Start date of CPA**

06/04/2018 is the start date of the CPA, which is the day of the first stove sale under the CPA , and after the PoA registration date, which is 13/08/2015.

**C.2. Expected operational lifetime of CPA**

21 years, 0 months.

**C.3. Crediting period of CPA****C.3.1. Type of crediting period**

CME selected renewable type of the crediting period with the duration of 7 years (84 months). It is expected that crediting period will be renewed 2 times.

**C.3.2. Start date of crediting period**

The start date of the crediting period will be the date of CPA inclusion into the registered PoA which is 06/04/2018.

**C.3.3. Duration of crediting period**

7 years, renewable. The duration of the crediting period of the CPA will be limited to the end date of the PoA regardless of when the CPA was added.



**SECTION D. Environmental impacts****D.1. Analysis of environmental impacts**

Please refer to Section E.1 in the PoA DD for details on environmental impact analysis. Please note that environmental analysis is provided at the PoA level, and no significant negative environmental impacts have been identified for the proposed project activity.

**D.2. Environmental impact assessment**

Environmental impact assessment is not required.

## **SECTION E. Local stakeholder consultation**

### **E.1. Modalities for local stakeholder consultation**

Stakeholder consultation is chosen to be conducted at a PoA level. Please refer to Section F in the PoA DD for details of stakeholder consultations.

### **E.2. Summary of comments received**

Feedback from the various stakeholders is overwhelmingly positive in Malawi and the CME is encouraged to expand the project to as many local communities as possible. Stakeholders are also hopeful that the project can eventually encourage households to move away from use of unsustainably (and illegally) produced charcoal in urban areas of Malawi

Advice and concerns raised by stakeholders include:

1. Need for community sensitisation and awareness creation of improved technologies and practices.
2. Potential for further efficiency improvements to the efficient kiln currently used to fire stoves
3. Need to monitor clay extraction sites and ensure plans to mitigate any environmental risks are implemented effectively.
4. Need to protect the Chitetezo Mbaula brand in Malawi via national certification process with the Malawi Bureau of Standards.
5. Need to ensure production groups grow their own trees to that their source of fuel for firing ceramic stoves is from a sustainable source.<sup>14</sup>

### **E.3. Consideration of comments received**

CME and CPA implementers seriously consider the issue of clay management with a view to minimising negative environmental impacts, strive to promote:

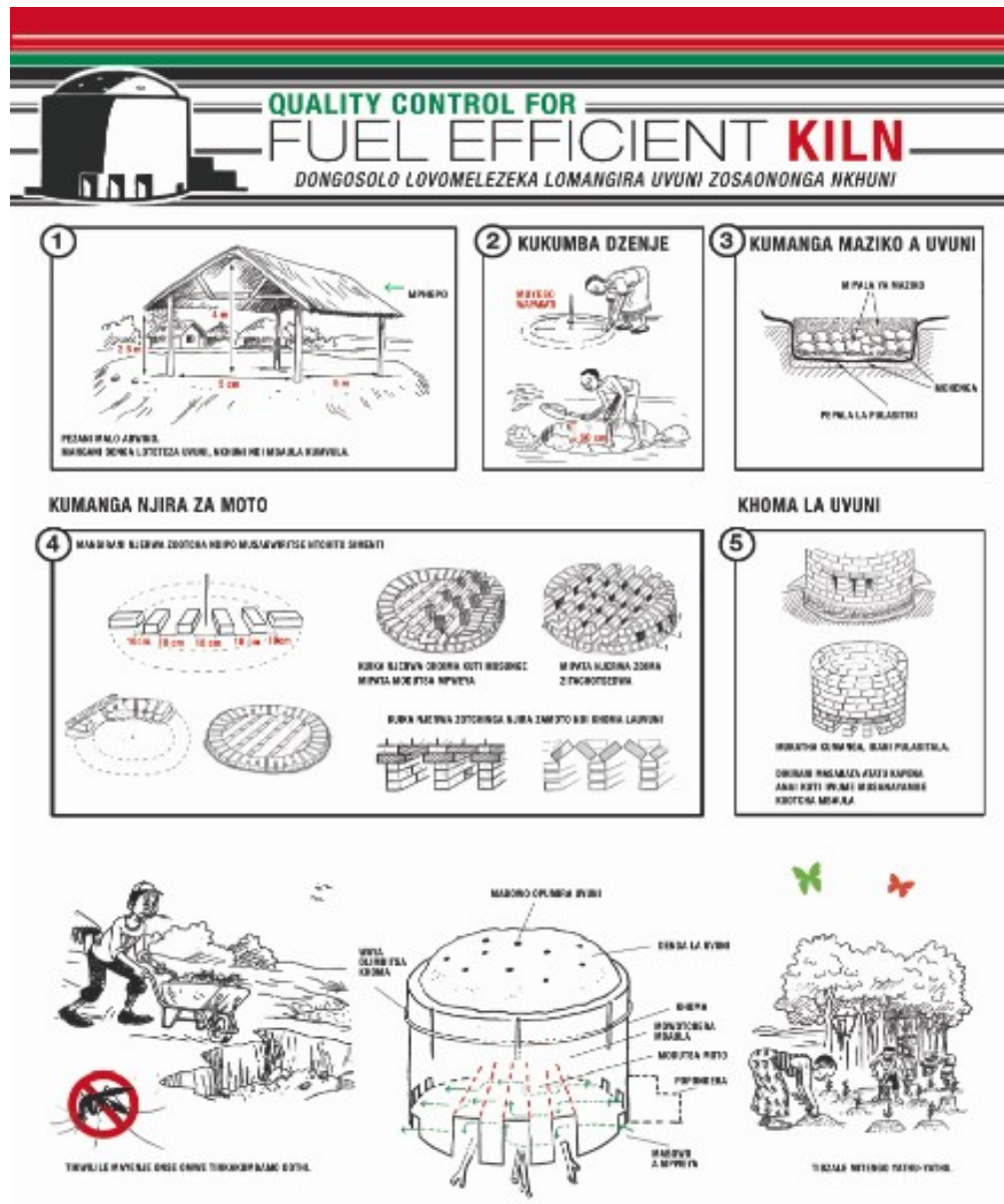
- the collection of clay from above-ground piles of earth;
- where above-ground sourcing is not possible, the minimisation of pit depths; and
- the rapid replacement of clay removed from pits with biodegradable household and agricultural wastes.

In addition, all production groups will be strongly encouraged to manage their own woodlots where they can source firewood to fuel their fuel-efficient kilns. The CME in collaboration with CPA implementers will promote this practice through information, communication and training materials, such as the poster shown below:

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<sup>14</sup>

Approximately 250 kg of firewood are used to fire 120 stoves. Allowing for stove breakages, less than 3 kg of wood are used to fire a ceramic stove, compared to over 1,000 kg of firewood saving per year (i.e. firewood savings of 1 day of use is greater than amount of food it takes to fire a ceramic stove). The firewood used to fire a stove is negligible compared to the firewood savings from its use over its lifetime.



Pic. 2. Poster on quality control during stove production

## SECTION F. Eligibility for inclusion

This CPA will be assessed using eligibility criteria detailed in POA-DD Section B.2, for inclusion into the POA and can be checked through this list:

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	Geographical	a. CPAs shall be located within the geographical boundaries set in the PoA, i.e. the Republics of Malawi and Rwanda, unless otherwise discussed with and approved by the CDM	Section A.2.	✓ The location of the CPA is within the geographic boundary of the Republic of Malawi, which is the same as the boundary of the PoA.
2	Methodology	b. CPA cookstoves will be assigned unique serial identification numbers to be etched into the stove and captured on Emission Reduction (ER) contracts together with end-user details (name, address, phone number – if available)	Total sales records database	✓ Each improved cook stove is assigned a unique serial number etched into each stove. This is to be stored electronically and will be checked for double counting by comparing the serial numbers and user details. End-users are best traced through stove marketers / promoters, who normally know best where the end-user resides. Along with the stove serial number the total sales database will include the information on the CPA it is included in.

**CDM-CPA-DD-FORM**

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
3	Methodology	<p>c. CPA cookstoves shall primarily target rural and peri-urban households using woody biomass for cooking and heating water.</p> <p>CPA stoves, whether single pot or multi pot, portable or in-situ, shall have a minimum rated efficiency of 20%.</p>	WBT reports	<p>✓ This CPA target demographic is primarily rural and peri-urban households using woody biomass for cooking and heating water.</p> <p>The thermal efficiency of the stove promoted in this CPA has been confirmed from independent reports (i.e. CREEC) on stove tests e.g. Water Boiling Test (WBT) as being 30.6% thermal efficient, which is greater than 20%.</p>
4	Start date	d. improved household cookstoves, whereby date of commission is assumed to be (i) the day after the date of sale for retail sales or (ii) for stoves 'fixed' into cooking space the day after the date of installation or (iii) the last day of the month after the month of delivery for bulk sales.	PoA DD, CPA DD, Total sales records database	<p>✓ This CPA complies with the eligibility criteria as 06/04/2018 is the start date of the CPA, which is the day of first installation, and after the PoA registration date, which is 13/08/2015. The start date of the CPA will be demonstrated by the records of CPA's total sales database and the copy of emission reduction contract or other similar document with the information about the sale date and serial number.</p>

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	Methodology	e. Each CPA shall conform to applied methodology of the PoA – AMS-II.G. Version 06: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass.	CPA DD	<p>✓ The applied methodology is referenced in the CPA-DD. The CPA introduces ICS model Chitetezo Mbaula, a local product made in Malawi. The efficiency of the introduced stoves is 30.6% which is more than 20%. The starting date of the CPA is 06/04/2018, which is to be confirmed by invoice / delivery note / signed emission reductions contract. Non-renewable biomass has been used in the project region since 31 December 1989. Please, refer to Section D.2. for details. CPA meets the applicability conditions of the applied methodology AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0).</p>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
6	Methodology	f. As per B.1, CPA stoves shall be isolated units to be used by households, communities or Small and Medium Enterprises (SMEs) and shall be under 750 kW installed capacity or under 3,000 MWh of energy savings per year or 3,000 tonnes of emission reductions per year.	PoA DD, CPA DD, ER calculation file	✓ The Chitetezo Mbaula, improved cook stove promoted in this CPA, generates under 3,000 MWh of energy savings per year (each household using a Chitetezo Mbaula saves approximately 2.457 tonnes of biomass per annum, which given the default net calorific value of biomass of 0.015 TJ / tonne of biomass and a conversion rate of 3.6 MJ / KWh it is estimated that the Chitetezo Mabula saves approximately 8.3 MWh of energy per year, clearly below the threshold of 3,000 MWh.
7	LSCs and EIA	g. LSCs and EIA for improved household cookstoves should be conducted at PoA level.	PoA DD	✓ Environmental impact assessment is conducted on PoA level. Stakeholders' consultation is conducted on a PoA level.
8	ODA	h. CPA funded through Official Development Assistance or diversion of such will not be eligible for inclusion in the PoA.		✓ A confirmation that the CPA does not lead to diversion of official development assistance is provided to the CME.
9	Methodology	i. Improved household cook stove CPAs should target domestic users using solid biomass as their primary fuel, with initial emphasis on low income rural and peri-urban communities.	CPA DD, Total sales records database	✓ CPA targets domestic users using solid biomass as their primary fuel, with initial emphasis on low income rural and peri-urban communities.

**CDM-CPA-DD-FORM**

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	Monitoring plan	j. CPAs shall follow the monitoring plan outlined in generic CPA-DD section B.7.2 (Description of the monitoring plan for a generic CPA), which adheres to applied methodology – AMS- II.G, Standard for sampling and surveys for CDM project activities and programme of activities V 04.1 and Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities V 3.0.	CPA-DD	✓ Monitoring plan in generic CPA-DD Section B.7.2 is referenced in CPA-DD.
11	Methodology	k. The ER target for each CPA shall not exceed the small-scale CPA aggregate energy savings limit of 60 GWh per year or 180 GWh thermal per year in fuel input.	ER calculation file	✓ The CPA leads to annual fuel savings of less than 180 GWh thermal per year in fuel input. Based on ex-ante calculations, ER target for CPA is 38,778 tCO <sub>2</sub> e and expected energy savings will be 176 GWh thermal per year in fuel input. This will be confirmed within the monitoring process.
12	Debundling	l. CPAs shall not be a debundled component of a larger scale project activity.	PoA DD	✓ CPAs are exempt from de-bundling. Please consult eligibility criterion L in section B.2 of the registered PoA DD.



## Appendix 1. Contact information of CPA implementers

<b>Organization name</b>	Hestian Innovation Ltd.
<b>Country</b>	British Virgin Islands
<b>Address</b>	Cragmuir Chambers, Road Town, Tortola
<b>Telephone</b>	+442071934710
<b>Fax</b>	N/A
<b>E-mail</b>	info@hestian.com
<b>Website</b>	www.hestian.com
<b>Contact person</b>	John O'Connor

<b>Organization name</b>	Norwegian Ministry of Climate and Environment
<b>Country</b>	Norway
<b>Address</b>	Kongensgate 20, Oslo, 0153
<b>Telephone</b>	+47 91 57 34 93
<b>Fax</b>	N/A
<b>E-mail</b>	malin.meyer@kld.dep.no
<b>Website</b>	<a href="https://www.regjeringen.no/no/dep/kld/id668/">https://www.regjeringen.no/no/dep/kld/id668/</a>
<b>Contact person</b>	Ms. Malin Meyer

## Appendix 2. Affirmation regarding public funding

The CPA does not involve any diversion of ODA.

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

This section is left blank intentionally.

## Appendix 4. Further background information on monitoring plan

This section is left blank intentionally.

## Appendix 5. Summary report of comments received from local stakeholders

This section is left blank intentionally.

## Appendix 6. Summary of post-registration changes

Category of change	
Permanent Changes	
1. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	Revision in the monitoring frequency of the monitored parameter <b><math>\mu y, i / 365</math></b> ( <i>"Number of days of utilization of the project device during the year 'y'"</i> )
2. Corrections	<ul style="list-style-type: none"> <li>a. updating contact person information for Norwegian Ministry of Climate and Environment;</li> <li>b. updating start dates of CPA in line with the actual start dates reported within monitoring activities;</li> <li>c. updating start dates of crediting period in line with information provided at PoA web-page at UNFCCC web-site</li> <li>d. CPA-DD Form update change</li> </ul>

<b>PS para 242 requirements</b>	<b>CME reporting on impacts</b>
The applicability and application of applied methodologies, applied standardized baselines and other applied methodological regulatory documents, with which the PoA or CPA has been registered or included	The applied methodology remains the same as applied in the registered monitoring plan. Thus, there has been no change in applicability and application of applied methodologies, applied standardized baselines and other applied methodological regulatory documents, with which the PoA or CPA has been registered or included
The compliance of monitoring plan with applied methodologies, applied standardized baselines and other applied methodological regulatory documents	Revision in the frequency of monitoring parameter <b><math>\mu y, i / 365</math></b> ( <i>"Number of days of utilization of the project device during the year 'y'"</i> ) <b>has changed in frequency of monitoring of parameter which was found to be in-line with the applied methodology.</b>
The level of accuracy and completeness in monitoring of PoA or CPA compared with requirements contained in registered monitoring plan;	There has been no direct impact of revision in the monitoring frequency of the parameter stated above on the level of accuracy and completeness in the monitoring of the PoA or the CPA
The additionality of the PoA or CPA;	There has been no impact of all proposed changes on additionality of the CPA. Also, there has been no new information added to CPA which would impact the additionality.
The scale of the CPA;	There has been no impact of all the proposed changes on the scale of CPA.
The eligibility criteria for inclusion of CPAs in the PoA	No change apart from updating dates.

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
09.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN);</li> <li>• Make editorial improvements.</li> </ul>
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: <ul style="list-style-type: none"> <li>• Remove appendix “Applicability of methodologies and standardized baselines” as the appendix is not relevant at the CPA level;</li> <li>• Make editorial improvement.</li> </ul>
07.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Improve consistency with the “CDM project standard for programmes of activities” and with the PDD and PoA-DD forms;</li> <li>• Make editorial improvement.</li> </ul>
06.0	24 May 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with the “Standard: CDM project standard for programme of activities” (CDM-EB93-A07-STAN) (version 01.0);</li> <li>• Incorporate the “Component project activity design document form for small-scale component project activities” (CDM-SSC-CPA-DD-FORM);</li> <li>• Make editorial improvement.</li> </ul>
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: <ul style="list-style-type: none"> <li>• Include provisions related to statement on erroneous inclusion of a CPA;</li> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to local stakeholder consultation;</li> <li>• Provisions related to the Host Party;</li> <li>• Make editorial improvement.</li> </ul>
03.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• 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));</li> </ul>

<i>Version</i>	<i>Date</i>	<i>Description</i>
		<ul style="list-style-type: none"> <li>• Include provisions related to standardized baselines;</li> <li>• 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;</li> <li>• Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and Appendix 6;</li> <li>• Change the reference number from F-CDM-CPA-DD to CDM-CPA-DD-FORM;</li> <li>• Make editorial improvement.</li> </ul>
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 Keywords: component project activity, project design document		