



**Monitoring report form for CDM programme of activities
(Version 04.0)**

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

MONITORING REPORT

Title of the PoA	Improved cook stoves and sustainable charcoal initiative		
UNFCCC reference number of the PoA	10516		
Version numbers of the PoA-DD applicable to this monitoring report	6.0		
Version number of this monitoring report	5		
Completion date of this monitoring report	06/04/2021		
Monitoring period number	1		
Duration of this monitoring period	26/06/2020 – 31/08/2020		
Monitoring report number for this monitoring period	1		
Coordinating/managing entity	Nature Club of Rajasthan		
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)	
	India	yes	
Applied methodologies and standardized baselines	AMS-II.G vers.10, AMS-III.BG. vers. 3 and AMS-I.E vers. 9		
Sectoral scopes	Scopes 1, 3 and 5		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0	41,004	0
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	55,883		

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

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The proposed PoA aims at reducing the fuel wood consumption of traditional stove users by disseminating improved cook stoves, mainly micro wood gasifier stoves, at subsidized prices. Moreover, the consumption of conventional charcoal by traditional charcoal users shall be reduced by providing them charcoal generated in micro wood gasifier stoves.

Overall objectives are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of ICS users due to improved indoor air quality.

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Generic CPA 2: Improved cook stoves and sustainable charcoal initiative, XXX	6.0	3: Energy demand 5: Chemical industries	AMS-II.G. ver. 10 - Energy efficiency measures in thermal applications of non-renewable biomass AMS-III.BG. ver. 3 - Emission reduction through sustainable charcoal production and consumption

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
10516-P1-0001-CP1: Improved cook stoves and sustainable charcoal initiative, CPA 1	6.0	Generic CPA 2: Improved cook stoves and sustainable charcoal initiative, XXX	26 Jun 2020 - 25 Jun 2027 (Renewable)	yes

A.2. Coordinating/managing entity

>>

Nature Club of Rajasthan

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

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a) Policy/measure or stated goal that the PoA seeks to promote

The proposed PoA aims at reducing the fuel wood consumption of traditional stove users by disseminating improved cook stoves, mainly micro wood gasifier stoves, at subsidized prices. Moreover, the consumption of conventional charcoal by traditional charcoal users shall be reduced by providing them charcoal generated in micro wood gasifier stoves.

Overall objectives are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of ICS users due to improved indoor air quality.

(b) Framework for the implementation of the proposed PoA

The PoA is a voluntary initiative of Nature Club of Rajasthan, who will act as CME. To date partners are atmosfair gGmbH, also Project Participant, who will provide funding and assist with CDM matters, and Sapient Infotech, who will e.g. manufacture stoves and distribute them at the

local level. Other partners like stove manufacturers, stove distributors, charcoal managers etc. may be included.

The PoA will facilitate the procurement of ICSs so that the end user can obtain them at subsidized prices. Carbon revenues will be used to fund ICS distribution and to cover monitoring costs. Moreover, the PoA shall facilitate the collection of charcoal generated in ICSs from selected users and the sale of this charcoal to users who would otherwise have used conventional charcoal. Additionally, selected users shall be provided with renewable biomass to run the ICS, allowing for saving even more conventional fuel wood.

Nature Club of Rajasthan will coordinate CDM-related activities, particularly coordinating the PoA and monitoring. Partners will be in charge of funding, production and distribution of stoves and the management of the logistics of charcoal collection and provision of renewable biomass.

c) Confirmation that this PoA is a voluntary action

This PoA is a voluntary action by Nature Club of Rajasthan.

d) Contribution to sustainable development

The PoA will contribute to sustainable development by

- Contributing to the conservation of forest resources in India
- Improving the economic situation of ICS users by reducing their expenses for fuelwood and allowing them to generate income by selling charcoal generated in the ICS.
- Improving health conditions of ICS users due to improved indoor air quality.

B.2. Post-registration changes to PoA

B.2.1. Corrections

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No corrections were done in the PoA during this monitoring period.

B.2.2. Inclusion of monitoring plan

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No monitoring plan was included in the PoA during this monitoring period.

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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No changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents were done in the PoA during this monitoring period.

B.2.4. Changes to programme design

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No changes to the programme design were done in the PoA during this monitoring period.

B.2.5. Changes specific to afforestation or reforestation activities

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n.a.

PART II Monitoring of CPAs

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SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

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Purpose and general description of CPA

The project activity aims at reducing the fuel wood consumption and indoor air pollution of traditional stove users in West Bengal, India by disseminating Improved Cook Stoves (ICS) of the type micro gasifier stove at subsidized prices. In addition, the consumption of conventional charcoal by selected users of conventional charcoal may be reduced by providing them charcoal generated in the wood gasifier stoves as a by-product.

55,291 stoves have been deployed under this project since its starting date. Charcoal collection and sale is ongoing. 55,291 stoves are included in the charcoal collection. Charcoal produced by the stoves users while cooking is collected every other week from the users.

Technology implemented

The ICS to be implemented in this project activity uses the TLUD Gasifier Cookstove technology. The TLUD is distributed to households using fuelwood for cooking. In the Top-Lit Up-Draft (TLUD) technology dry biomass fuel is ignited on the top of a vertical container, starting the process of pyrolysis. While a pyrolysis front moves downwards, the produced wood gas moves upward and as it exits the stove it is combusted in a flame appropriate for cooking. The TLUD allows for significant savings of firewood compared to traditional stoves and additionally generates charcoal. Its design ensures efficient combustion of fuel and cleaner fire; it therefore uses considerably less fuel as compared to traditional stoves. This means speedy cooking, time and fuel savings, cleaner pans, kitchen walls and indoor atmosphere. Charcoal is not combusted in the TLUD stove, it can therefore be collected and used for other purposes.

Timeline

Date	Milestone
07/06/2018	Start Date of the PoA (first notification of prior consideration Form to UNFCCC)
12/08/2018	Local Stakeholder Consultation
29/10/2019	PoA registration date
26/06/2020	CDM inclusion date of CPA 1
10/09/2018	Start of sales of stoves
31/08/2020	Sale of last TLUD stove included in this monitoring period
31/08/2020	End of the 1st monitoring period

C.2. Location of CPAs

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The project boundary of this CPA is West Bengal, India

The project activity is implemented in several villages and households in the state of West Bengal.

The coordinates of the center of the project activity in Berachampa (local office of Sapiant) are used to represent the physical location of the project activity:



- Latitude: 22° 41' 45.4236" N
- Longitude: 88° 41' 18.78" E

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents

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No temporary deviations from registered monitoring plan or applied methodology have been applied during this monitoring period.

C.3.2. Corrections

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The UNFCCC approved the PRC of the CPA DD "Improved cook stoves and sustainable charcoal initiative, CPA 1" with CDM reference number: 10516-P1-0001-CP1 on 06/04/2021. PRC ref No. is PRC-10516-001, the effective approval date is 05/04/2021.

The corrections were:

Section A1:

- The evidence calculation for the Micro Scale Limit was corrected, since a wrong formula for the calculation formula was used.
- The reference to the Project standard regarding the microscale limits was corrected.

Section A3:

- The stove lifetime was corrected. It now reflects the manufacturer's specifications.

Section A.7:

- The history of the CPA section was corrected and missing information on similar projects implemented in the same project region was added.

Section B4.2:

- The parameter table for the NCV_{charcoal} was moved to the section B5.1 since it is a monitoring parameter and measurement methods and procedures for the parameter NCV_{charcoal} were corrected since they were not in line with the PoA DD.

Section B4.3

- The table for ex-ante emission calculation was corrected, since it did not reflect the source of data as per the monitoring plan of the CPA. It is now in line with the monitoring plan of the CPA.

Section B5.1:

- The parameter table for the parameter t_y was deleted, since it is not relevant for the calculation of ER as outlined in the Monitoring Plan.

There are no other corrections to programme information or parameters fixed at registration that

- (a) have been approved by the Board for the periods prior to this monitoring period
- (b) have been approved by the Board for this monitoring period
- (c) are being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track).

C.3.3. Changes to the start date of the crediting period

>>No changes to the start date of the crediting period have been approved during this monitoring period or submitted with this monitoring report.

C.3.4. Inclusion of monitoring plan

>>not applicable

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

>>No permanent changes from the registered monitoring plan or applied methodologies have been approved during this monitoring period or submitted with this monitoring report.

C.3.6. Changes to project design

>>No changes to the project design of the project activity have been approved during this monitoring period or submitted with this monitoring report.

C.3.7. Changes specific to afforestation or reforestation CPA

>>Not applicable.

SECTION D. Description of monitoring system of CPAs

>>There is a continuous documentation of all ICS distributions and charcoal collection in a centralized database. For the preparation of monitoring reports, samples were drawn from the centralized database and the corresponding stoves were examined regarding the relevant parameters.

Charcoal generation is monitored through invoices/receipts from charcoal sales.

Each ICS has a unique ID. This ID consists in a letter and a number of at least four digits.

The CME and/or PP hold the responsibility for all procedures related to monitoring, but cooperate with regional or local institutions involved in ICS distribution.

Central stove database

A central stove database is operated and maintained by the CME and/or PP to ensure completeness and accuracy of monitoring information. The basic information for ICSs distributed to households are:

- Unique number (Stove-ID) of system
- Commissioning date of appliance (at the user's place)
- User details (name, address, phone number)
- Distributor

The information in these databases is updated continuously, whenever new data (distribution contracts) are available. Original copies of the distribution contracts (or whatever format is used to collect the data required) are kept and maintained for two years after the end of the crediting period.

As for charcoal sales, there is a database on charcoal sales, based on invoices/receipts of sales to charcoal buyers.

Stove IDs

Each ICS will obtain a unique number which facilitates its identification in the data base and avoid double counting. These unique numbers will be provided by the CME and/or PP and shall be inserted in the distribution contract at the moment of distributing the stove.

It is planned to make the unique numbers visible on the ICSs, for example by blowtorching numbers on the stove material.

Direct Monitoring

The following parameters are monitored directly, thus no sampling is necessary: $N_{y,i,j}$ and $Q_{CCP,i,y}$.

Sampling campaigns

Sampling campaigns consist in generating extracts of the central database for checks in order to prepare the monitoring reports. A representative number of ICS will be selected randomly for site visits in order to check the following monitoring parameters:

Proportional parameters:

- $DO_{II,G,y}$

Mean parameters:

- $\eta_{new,i,j}$
- to determine $B_{y=1,new,survey}$
 - $load_y$
 - $fillings_y$

Different sample sizes can be selected for each of these parameters.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

Data/Parameter	NCV _{wood} or NCV _{biomass}
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	AMS-II.G, version 10, default value
Value(s) applied	0.0156
Choice of data or measurement methods and procedures	This is the IPCC default value for wood fuel as provided by AMS II.G version 10, para. 17.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	NCV _{charcoal,default}
Unit	GJ/tonne
Description	Default net calorific value of charcoal
Source of data	AMS-III.BG
Value(s) applied	29.5
Choice of data or Measurement methods and procedures	Default value according to AMS-III.BG, appendix 1 option 1, from IPCC 2006, Volume 2, Table 1.2
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$f_{NRB,y}$
Unit	%
Description	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass
Source of data	Calculated
Value(s) applied	87.18% (value for West Bengal)
Choice of data or Measurement methods and procedures	See CPA DD B.4.
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	EF _{projected_fossilfuel}
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Unit	tCO ₂ /TJ
Description	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers.
Source of data	AMS-II.G, version 10, default value under para. 17.
Value(s) applied	63.7
Choice of data or Measurement methods and procedures	Default value as provided by AMS II.G version 10, par.17
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	L_y
Unit	Fraction
Description	Leakage adjustment factor period y
Source of data	Default value
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	According to AMS-II.G, version 10, para 29, B _{y,i,j,savings} can be multiplied by a net to gross adjustment factor 0.95 to account for leakage in which case surveys are not required.
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	CF
Unit	-
Description	Conversion factor fuelwood to conventional charcoal
Source of data	AMS–III.BG, version 3
Value(s) applied	6
Choice of data or Measurement methods and procedures	Default value given in AMS–III.BG, version 3
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	GWP_{CH4}
Unit	t CO ₂ e/t CH ₄
Description	Global warming potential of methane
Source of data	www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14
Value(s) applied	25
Choice of data or Measurement methods and procedures	IPCC default value www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	SMG_{y,b}
Unit	t CH ₄ /t
Description	Specific methane generation for the baseline charcoal generation process in the year y
Source of data	AMS–III.BG, version 3.
Value(s) applied	0.030

Choice of data or Measurement methods and procedures	Default value given in AMS–III.BG, version 3.
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

Data/Parameter	M_d
Unit	t CH ₄ /t
Description	Factor to account for any legal requirement for capture and destruction of methane in the charcoal production facility
Source of data	AMS–III.BG, version 03.
Value(s) applied	0
Choice of data or Measurement methods and procedures	There is obviously no requirement on capture and destruction of methane in micro gasifier stoves
Purpose of data/parameter	Calculation of baseline emissions
Additional comment	-

E.2. Data and parameters monitored

(Copy this table for each data or parameter.)

Data/Parameter	$B_{y=1,new,survey}$	
Unit	t/year	
Description	Quantity of woody biomass used by project devices in tonnes per project device	
Measured/calculated/default	Calculated	
Source of data	Survey on <i>fillings</i> _{y=1} and <i>load</i> _{y=1} as described below.	
Value(s) of monitored parameter	1.736	
Monitoring equipment		<u>Precision Balance</u>
	Type/Name	ST III
	Accuracy class	+/- 0.5 g
	Serial number	3330
	Calibration date	05.02.2020
Measuring/reading/recording frequency	Annually	

Calculation method (if applicable)	<p>$B_{y=1,new,survey} = fillings_{y=1} * load_{y=1} * 0.052$ (conversion factor to from kg /week to t/a)</p> <p>$fillings_{y=1}$: Average number of weekly fillings of a batch-loaded ICS $fillings_{y=1}$: 31.27</p> <p>$load_{y=1}$: Average amount of fuelwood used per filling of an ICS $load_{y=1}$: 1.068 t</p> <p>The average weight of a ICS fuelwood load was determined as the average value obtained over all WBTs that are conducted to determine $\eta_{new,j}$.</p> <p>$B_{y=1,new,survey} = fillings_{y=1} * load_{y=1} * 0.052$</p> <p>$B_{y=1,new,survey} = 31.27 * 1.068 \text{ t} * 0.052 = 1.736 \text{ t}$</p>
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	η_{old}
Unit	%
Description	Efficiency of the baseline system being replaced
Measured/calculated/ default	AMS-II.G, version 10, default value
Source of data	According to AMS II.G, ver. 10, Table 17, a default value of 0.10 can be used, if the “pre-project device, which is a three stone fire using firewood (not charcoal) , or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney”. Traditional stoves in India meet these conditions.
Value(s) of monitored parameter	10
Monitoring equipment	-
Measuring/reading/recording frequency	Fixed for each individual household when included in the project activity database
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$\eta_{new,j}$
Unit	%
Description	Efficiency of the device of each type <i>i</i> and batch <i>j</i> implemented as part of the project activity. calculated without accounting for the remaining charcoal
Measured/calculated/ default	measured
Source of data	Primary data collection during monitoring campaigns by Sapients dedicated monitoring team based on WBT.
Value(s) of monitored parameter	27.78%

Monitoring equipment		<u>Precision Balance</u>
	Type/Name	ST III
	Accuracy class	+/- 0.5 g
	Serial number	3330
	Calibration date	05/02/2020
		<u>Thermometer</u>
	Type/Name	Digital Thermometer Elanco
	Accuracy class	0.01°C, Temperature range -50° C - +200° C
	Serial number	T18978
	Calibration date	30.01.2020
Measuring/reading/recording frequency	Annually	
Calculation method (if applicable)	<p>Adjustment of $\eta_{new,ij}$ due to efficiency loss will be monitored according to AMS-II.G version 10 para 32.</p> <p>No batches were established for the ER calculation. Thus the stove efficiency was determined from a representative random subsample of all stoves included in the monitoring period.</p> <p>The efficiency of the project devices will be monitored annually following the Water Boiling Test (WBT) protocol version 4.2.3, performed by a dedicated monitoring team. All WBTs will be conducted under field conditions.</p> <p>Several WBTs will be conducted on randomly selected ICS; the sample size of ICSs tests will be large enough to meet the requirements of the sampling standard. A single test run will be conducted for each ICS tested.</p> <p>Where ER are claimed under AMS-III.BG. for the use of charcoal outside the ICS, the WBT results will be evaluated without accounting for remaining charcoal, according to AMS-III.BG.</p>	
QA/QC procedures	<p>It will be assured that all requirements of the sampling plan of the CPA are met.</p> <p>Data will be collected using the standard procedures and will be stored for the crediting period and an additional two years.</p> <p>Only calibrated equipment will be used, according to requirements in the project standard vers. 2.0.</p>	
Purpose of data/parameter	Calculation of baseline emissions	
Additional comments	-	

Data/Parameter	$N_{y,j}$
Unit	Number
Description	Adjusted total number of ICS of batch j operating during year y.
Measured/calculated/default	Calculated
Source of data	Primary data source are copies of ICS sales contracts signed by stove users, including the date of sale. These are the basis for the Sales Record Database, including all ICS users.
Value(s) of monitored parameter	9,671
Monitoring equipment	-
Measuring/reading/recording frequency	The database will be updated according to the frequency of ICS sales, at least annually.

Calculation method (if applicable)	<p>The measurement of the parameter will be based on the number of sales contracts stored and the corresponding number of entries of ICS sold in the database.</p> <p>For ICS that have been sold within the relevant monitoring period, only the number of days between the sales date (date of commissioning of the project device) and the end of the monitoring period will be considered. Therefore, $N_{y,j}$ will include an adjustment factor by applying the following formula:</p> $N_{y,j} = N_{soldtotal,y,j} * d_{average,y} / mlength_y$ <p>Where: $N_{soldtotal,y,j}$ total number of ICS of batch j sold within monitoring period y $d_{average,y}$ average number of days ICS were operational in period y, derived from sales dates on sales contracts $mlength_y$ length of period y</p> <p>No adjustment will apply to the number of ICS sold before the current monitoring period.</p>
QA/QC procedures	Data and contracts will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of carbon credits for this project activity, whichever occurs later.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	In case no batches are established, the commissioning date of each device is the sales date of the device

Data/Parameter	$DO_{ll.G,y}$
Unit	%
Description	Statistically adjusted drop out from total population of ICS in period y
Measured/calculated/default	Measured
Source of data	Primary data collection: dedicated monitoring team; database maintenance: CME and/or PP
Value(s) of monitored parameter	0
Monitoring equipment	-
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	The Drop outs will be determined by sampling through interviews where it will be checked if the appliances are still operational, performed by a dedicated monitoring team. Interviews will be reported in a questionnaire.
QA/QC procedures	It will be assured that all requirements of the sampling plan of the CPA are met.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

Data/Parameter	$Q_{CCP,i,y}$
Unit	Tonnes
Description	Produced quantity of charcoal product <i>i</i> in year <i>y</i>
Measured/calculated/default	Measured

Source of data	Measurement from project activity production and delivery to eligible charcoal buyers																														
Value(s) of monitored parameter	3,196.44																														
Monitoring equipment	<p>Data is received from sales invoices</p> <p>Specifications of scales used:</p> <table border="1"> <tr> <td></td><td><u>Balance Deganga</u></td></tr> <tr> <td>Type/Name</td><td>AMI</td></tr> <tr> <td>Serial number</td><td>60750201</td></tr> <tr> <td>Accuracy Class</td><td>Class III</td></tr> <tr> <td>Calibration date</td><td>05/02/2020</td></tr> </table> <table border="1"> <tr> <td></td><td><u>Balance Uluberia</u></td></tr> <tr> <td>Type/Name</td><td>B.M. Group, Model BMPIII</td></tr> <tr> <td>Serial number</td><td>1625</td></tr> <tr> <td>Accuracy Class</td><td>Class III</td></tr> <tr> <td>Calibration date</td><td>24/02/2020</td></tr> </table> <table border="1"> <tr> <td></td><td><u>Purba Medinipur Balance</u></td></tr> <tr> <td>Type/Name</td><td>Silver Eagle, MMH-PF</td></tr> <tr> <td>Serial number</td><td>E 16429</td></tr> <tr> <td>Accuracy Class</td><td>Class III</td></tr> <tr> <td>Date of Calibration certificate</td><td>03/07/2020</td></tr> </table>		<u>Balance Deganga</u>	Type/Name	AMI	Serial number	60750201	Accuracy Class	Class III	Calibration date	05/02/2020		<u>Balance Uluberia</u>	Type/Name	B.M. Group, Model BMPIII	Serial number	1625	Accuracy Class	Class III	Calibration date	24/02/2020		<u>Purba Medinipur Balance</u>	Type/Name	Silver Eagle, MMH-PF	Serial number	E 16429	Accuracy Class	Class III	Date of Calibration certificate	03/07/2020
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Serial number	E 16429																														
Accuracy Class	Class III																														
Date of Calibration certificate	03/07/2020																														
Measuring/reading/recording frequency	continuously at the time of delivery to charcoal buyers or retailers																														
Calculation method (if applicable)	<p>The parameter will be monitored according to one of the following options:</p> <p>Option1: Direct measurement (e.g. use of a scale) of the weight of charcoal products supplied; at the site of the charcoal users or retailers</p> <p>Option 2: Calculation of the total weight of charcoal supplied; based on the total number of bags supplied (e.g. using systematic sampling method).</p> <p>Option 1 was used during this MP.</p> <p>$Q_{CCP,i,y}$ will be derived from invoices/receipts of sales of charcoal generated in the CPA to charcoal users and retailers. If feasible, the weight of charcoal delivered will be indicated on invoices, requiring the availability of calibrated weighbridges or other scales.</p> <p>Simultaneously, it will be checked that charcoal buyers are eligible according to para. 4 of AMS-III.BG version 03.</p>																														
QA/QC procedures	<p>The entire chain of charcoal collection will be documented, demonstrating how the amount of charcoal delivered to users of conventional charcoal relates to the amount generated by users.</p> <p>There will be cross checks with:</p> <ul style="list-style-type: none"> - total quantity of charcoal generated by the micro gasifiers based on monitored fuelwood consumption and the observed conversion-rate to charcoal. - the average amounts of charcoal collected from stove users based on records of field assistant collecting charcoal 																														
Purpose of data/parameter	Calculation of baseline emissions																														
Additional comments	-																														

Data/Parameter	NCV_{charcoal}
Unit	GJ/ton
Description	Net calorific value of charcoal type i generated in ICSs in the project activity
Measured/calculated/default	Measured
Source of data	Three samples per quarter were taken from the stocks of charcoal collected from users before selling it to charcoal users/retailers. The charcoal calorific value of charcoal produced in the TLUD was determined in the Escaps Private Ltd. Laboratory, accredited by the national accreditation board for testing and calibration Laboratories, India, according to relevant national/international standards.
Value(s) of monitored parameter	29.05
Monitoring equipment	-
Measuring/reading/recording frequency	Monitored once during the first year of the crediting period
Calculation method (if applicable)	Option 1: monitored once during the first year of the crediting period. Measurement is undertaken in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period provided that there is no change in the biomass types used for charcoal i production.
QA/QC procedures	Calculation of baseline emissions
Additional comments	-

Data/Parameter	Life Span
Unit	Number of years
Description	The operating life time of the project device.
Measured/calculated/default	-
Source of data	Manufacturer (certified by a national standards body or an appropriate certifying agent recognized by that body)
Value(s) of monitored parameter	7
Monitoring equipment	Fixed and recorded at the time of commissioning
Measuring/reading/recording frequency	-
Calculation method (if applicable)	-
QA/QC procedures	-
Purpose of data/parameter	Determination of stove lifetime
Additional comments	-

Data/Parameter	Date of commissioning of project device i
Unit	Date
Description	Actual date of commissioning of the project device
Measured/calculated/default	Measured

Source of data	The stove sales database.
Value(s) of monitored parameter	Several dates starting from 10/09/2018
Monitoring equipment	-
Measuring/reading/recording frequency	Fixed and recorded at the time of commissioning/distribution
Calculation method (if applicable)	-
QA/QC procedures	Data will be tracked in a stove database and will be stored for the crediting period and an additional two years.
Purpose of data/parameter	Calculation of emission reduction
Additional comments	-

Data/Parameter	$N_{d,HH}$
Description	Number
Measured/calculated/default	Number of project devices distributed per household
Source of data	Stove data base
Value(s) of monitored parameter	1
Monitoring equipment	-
Measuring/reading/recording frequency	Fixed and recorded at the time of commissioning/distribution
Calculation method (if applicable)	Data will be collected in the stove database and will be stored for the crediting period and an additional two years.
QA/QC procedures	-
Purpose of data/parameter	Calculation of emission reduction
Additional comments	-

E.3. Implementation of sampling plan

>>

a) Description of implemented sampling design

Due to the high number of ICS to be deployed an annual check of all appliances is not feasible. Sampling methods will also be applied to determine the annual or biennial values for $DO_{ll,G,y}$, $\eta_{new,i,j}$, and parameters to determine $B_{y=1,new,survey}$ (**load_y and fillings_y**).

For all sampled parameters directly related to stoves, the sampling procedure is a simple random sampling process. Random samples are drawn from the central stove database via a computerized randomizer.

$N_{y,j}$ was monitored through sales/distribution records for all appliances deployed till the end of the Monitoring period, whereas the other parameters were determined through a sampling campaign.

$Q_{CCP,y}$ was monitored using Option1 described in the CPA DD: $Q_{CCP,y}$ was derived from invoices/receipts of sales of charcoal generated in the CPA to charcoal users and retailers. The weight of charcoal delivered was indicated on invoices.

b) Sampling requirements as per sampling standard and applicable methodology

Coverage of sampling requirements in the applicable methodology:

As per applicable methodology AMS-II.G ver. 10. par. 41, “when biennial inspection is chosen a 95% confidence interval and a 10% margin of error requirement shall be achieved for the sampling parameter. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/10 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision”.

Additional requirement for PoAs as per sampling standard:

In case a single sampling plan for more than one CPA is used, “parameter values shall be estimated by sampling in accordance with the requirements in the applied methodology separately and independently for each of the CPAs included in a PoA except when a single sampling plan covering a group of CPAs is undertaken applying 95/10 confidence/precision for the sample size calculation”, as per EB 50 Annex 30 STAN, version 07.0.

Since the CPA consists only of CDM microscale Units, 95/10 confidence and precision was applied.

c) Target Population

For the monitoring parameters $DO_{ll,G,y}$, $\eta_{new,i,j}$, $load_y$ and $fillings_y$ the target population consists in all ICS which are included until the end of the specific monitoring period. The sample was drawn from database containing all ICS which are included until the end of the monitoring period.

Sampling for CPA 10516-0001

As described in the PoA DD, a central stove database was established, including data on all TLUD stoves sold since the start date of the project, including information on:

- Stove ID (unique number of stove)
- Delivery date of appliance (to user)
- Field assistant who sold the stove
- User details (Name, Address, phone number if available etc.)

A total of 55,291 stoves was included in the database.

d) Sampling method

Simple random sampling was applied.

The largest number for the sample size was chosen for the sampling effort with one common survey for $DO_{ll,G,y}$ and $fillings_y$. For the monitoring of $\eta_{new,i,j}$ and $load_y$, a random sub-sample from the common sample was drawn according to the calculated sample size of the parameter.

The users were randomly selected via a computerized randomizer from the sales record databases containing the full ICS population considered under CPA 10516-0001 for this Monitoring Period. Simple random sampling was applied for all stove related parameters.

Random distribution

All random selections will be stored for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. In this way the traceability of the selection is assured.

e) Sample size

For $DO_{II,G,y}$ a sample size of 21 was calculated, for $fillings_{y=1}$ the calculated sample size was 12. According to the sampling standard and the CPA DD the minimum sample size for percentage parameters is 30. Taking into account possible non response rate of 85%, we increased the size of the monitoring list for the common survey of $DO_{II,G,y}$ and $fillings_{y=1}$ to 36.

For $\eta_{new,j}$, the calculated sample size was 7, for the parameter $load_{y=1}$ it was 7. We chose a larger sample size of 9 samples for the common sample applying oversampling. Taking into account possible non response rate of 85%, we increased the size of the monitoring list for the common survey of $\eta_{new,j}$, and $load_{y=1}$ to 11.

Expected parameter values

Parameter	n*	Value	Standard deviation	Confidence	Precision	95/10 precision?
$DO_{II,G,y}$	30	0	n.a	95%	0%	yes
$fillings_{y=1}$	30	31.27	3.55	95%	4.24%	yes
$load_{y=1}$	9	1.068	0.007	95%	0.50%	yes
$\eta_{new,1}$	9	27.78	0.002	95%	0.56%	yes

The list of samples for the common sample for $DO_{II,G,y}$ and $fillings_{y=1}$ included 36 households. 30 of them could be interviewed during the time of the interview period. This is the minimum sample size requested in the sampling standard and the CPA DD and more than required from the sample size calculation. $DO_{II,G,y}$ was 0%, meaning that all distributed stoves are in use.

The list of samples for the common sample for $\eta_{new,j,y}$ and $load_{y=1}$ included 11 households. 9 tests could be conducted, meaning the calculated minimum sample size was reached.

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

>>

Emission reductions are calculated by summarizing ER from the stove efficiency-component (applying AMS-II.G) and the charcoal-production-component (applying AMS-III.BG).

(equation 1)

$$ER_{total} = ER_{II.G} + ER_{III.BG}$$

Where:

ER_{total}	Total emission reductions of the CPA
$ER_{II.G}$	Emission reductions of the stove efficiency component
$ER_{III.BG}$	Emission reductions of the charcoal generation component

Emission reductions from the Stove Efficiency Improvements Component (AMS-II.G)

It is formally 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. Therefore, emission reductions are calculated by multiplying the thermal energy from annual biomass savings stemming from non-renewable biomass with an emission factor for fossil fuels.

The following equation applies as per AMS-II.G par. 17:

$$ER_{II.G,y} = \sum_i \sum_j ER_{II.G,y,i,j} - LE_y$$

Where:

i	Indices for the situation where more than one type of project device is introduced to replace the pre-project devices
j	Indices for the situation where there is more than one batch of project device
ER_y	Emission reductions during year y in t CO ₂ e
$ER_{y,i,j}$	Emission reductions by project device of type i and batch j during year y in t CO ₂ e

(equation 3)

$$ER_{II.G,y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_{y,i,j} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil\ fuel}$$

Where:

$B_{y,savings,i,j}$	= Quantity of woody biomass that is saved in tonnes per cook stove device of type i and batch j during year y
$f_{NRB,y}$	= Fraction of woody biomass that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on the CDM website.
$NCV_{biomass}$	= Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected_fossil\ fuel}$	= Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 t CO ₂ /TJ
$N_{y,i,j}$	= Number of project devices of type i and batch j operating during year y ,
$\mu_{y,i,j}$	= Adjustment to account for any continued use of pre-project devices during the year y . Set to one according to AMS-II.G par 17.
LE_y	= Leakage emissions in the year y

$N_{y,i,j}$ is monitored directly, for $NCV_{biomass}$ and $EF_{projected_fossil\ fuel}$, the indicated default values are used, and LE_y is set to zero, since leakage is considered by multiplying $B_{y,savings,i,j}$ with net to gross adjustment factor of 0.95. μ_y is set to 1, since equation 7 of AMS-II.G vers. 10 is used.

$B_{y,savings,i,j}$ and $f_{NRB,y}$ are determined as follows:

Determination of $B_{y,savings,i,j}$

According to AMS-II.G, four options are given to determine $B_{y,savings,i,j}$. Here, the third option (WBT) is chosen, with the corresponding formula:

(equation 4)

$$B_{y,savings,i,j} = B_{y=1,new,i,survey} \times \left(\frac{\eta_{new,i,j}}{\eta_{old,i,j}} - 1 \right)$$

Where:

- $B_{y=1,new,i,survey}$ = Quantity of woody biomass used by project devices in tonnes per device of type i .
- $\eta_{old,i,j}$ = Efficiency of the old devices being replaced by project devices of type i and batch j .
- $\eta_{new,i,j}$ = Efficiency of the project device i and batch j .
Charcoal generated in the ICS will not be considered to derive η_{new} if this charcoal will be used outside the ICS, according to AMS-III.BG.

Combined equation for $ER_{II.G,y}$

(equation 5)

$$ER_{II.G,y} = \sum_i \sum_j B_{y=1,new,i,survey} \times \left(\frac{\eta_{new,i,j}}{\eta_{old,i,j}} - 1 \right) \times 0.95 \times N_{y,i,j} \times \mu_{y,i,j} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected,fossil\ fuel}$$

Determination of the Share of Non-Renewable Biomass

f_{NRB} was fixed ex ante to 87.18%, according to methodological TOOL30 vers.2, par. 8.

Leakage

The default net to gross adjustment factor of 0.95 is applied to account for leakage and therefore surveys are not required.

Emission reductions from the charcoal generation component (AMS-III.BG)

AMS-III.BG. was applied according to the provisions for charcoal production in micro gasifier stoves.

The applicable main formula given in AMS-III.BG version 03 is:

(equation 7)

$$ER_{III,BG,y} = \sum_i Q_{CCP,i,y} \times \left[\left(CF \times NCV_{wood} \times \frac{NCV_{charcoal}}{NCV_{charcoal,default}} \times f_{NRB,BL,wood} \times EF_{projected_fossilfuel} \right) + (SMG_{y,b} - M_d) \times (1 - f_{NRB,BL,wood}) \times GWP_{CH_4,y} \right] - PE_{y,fugitive} - PE_{y,flaring} - PE_{FF,y} - PE_{El,y} - PE_{BC,y}$$

Where

$ER_{III,BG,y}$	= Emission reductions in year y (t CO ₂ e/yr)
$Q_{CCP,i,y}$	= Quantity of charcoal type i produced and used in year y (t)
CF	= Default wood to charcoal conversion factor
NCV_{wood}	= Net calorific value of wood (TJ/t)
$NCV_{charcoal}$	= Net calorific value of the charcoal produced during the project (TJ/t)
$NCV_{charcoal,default}$	= Default net calorific value of charcoal (TJ/t)
$f_{NRB,BL,wood}$	= Fraction of biomass used in the absence of the project activity that can be established as non-renewable biomass; determined as per the procedure found in the latest version of AMS-I.E. Determined here as described in this section B.6.1 under AMS-II.G.
$EF_{projected_fossilfuel}$	= Emission factor for the substitution of non-renewable woody biomass by similar consumers (t CO ₂ /TJ)
$GWP_{CH_4,y}$	= Global warming potential of methane applicable to the crediting period (t CO ₂ e/t CH ₄)
$SMG_{y,b}$	= Specific methane generation for the baseline charcoal generation process in the year y; a default value of 0.030 t CH ₄ /t charcoal may be used.
M_d	= Factor to account for any legal requirement for capture and destruction of methane in the charcoal production facility (tonne of CH ₄ /tonne of raw material)
$PE_{y,flaring}$	= If applicable, emissions due to the flare inefficiency. In case captured pyrolysis gas is gainfully used (e.g. used for production of heat as in the case of micro-gasifier), then it can be taken as zero.
$PE_{FF,y}$	= Project emissions due to fossil fuel consumption in charcoal production facilities in year y (t CO ₂)
$PE_{El,y}$	= Project emissions due to electricity consumption in charcoal production facilities in year y (t CO ₂)
$PE_{BC,y}$	= Project emissions due to biomass cultivation in year y (t CO ₂)

$PE_{y,flaring}$ is not applicable since pyrolysis gas is used for cooking. M_d is set to zero since there is obviously no legal requirement to capture methane in micro gasifier stoves. $PE_{FF,y}$ and $PE_{El,y}$ are not considered since no fossil fuels or electricity are used in the ICS; $PE_{BC,y}$ is not applicable since no biomass will be cultivated for charcoal production since it is produced as a by-product of daily cooking.

$PE_{y,fugitive}$ is calculated as follows :

(equation 8)

$$PE_{y,fugitive} = \sum_i Q_{CCP,i,y} \times GWP_{CH_4,y} \times SMG_{y,b} \times f$$

Where:

- $PE_{y,fugitive}$ = Fugitive emissions from operation of charcoal producing facility (physical leakage) in the year y (t CO₂e)
- f = A fraction attributed to project charcoal production technology, use a default value of 0.1.
- $Q_{CCP,i,j}$ = Quantity of charcoal type i produced and used in year y (t)

Equations 7 and 8 can thus be combined and simplified:

(equation 9)

$$ER_y = \sum_i Q_{CCP,i,y} \times \left[\left(CF \times NCV_{wood} \times \frac{NCV_{charcoal}}{NCV_{charcoal,default}} \times f_{NRB,BL,wood} \times EF_{projected_fossilfuel} \right) + SMG_{y,b} \times (0.9 - f_{NRB,BL,wood}) \times GWP_{CH_4,y} \right]$$

$f_{NRB,y}$ is determined as fixes parameter ex-ante to 87.18%.

Leakage:

Since charcoal generated in ICS is a by-product of daily cooking, there are no leakage effects. According to the methodological tool (EB83, annex 15), para. 22, "competing uses for biomass are not relevant, where the biomass is generated as part of the project activity".

The calculation of emission reductions per distributed stove and year is summarized in the table below:

Parameter ID	Description	Derived as	Unit	Value
A	$B_{y=1,new,survey}$	Fixed	tons/a	1.74
B	$\eta_{new,j}$ (efficiency of the project device batch j implemented as part of the project activity from a WBT without considering remaining charcoal)	Monitored	%	27.78%
C	η_{old} (efficiency of replaced stove)	AMS-II.G default	%	10.00%
D	L_y : Discount for leakage	AMS-II.G		95.00%
E	$B_{savings}$ per stove	$A * ((B/C) - 1) * D$	tons/a	2.93

F	f_{NRB} : fraction of non-renewable biomass	NRB/(NRB+DRB), for West Bengal	%	87.18%
G	$EF_{projected_fossilfuel}$	AMS-II.G default	tCO ₂ /TJ	63.7
H	$NCV_{biomass\ or\ wood}$	AMS-II.G default	TJ/t	0.0156
ER _{II.G} per ICS		$E*F*G*H$	tons/a	2.54
J	$Q_{CCP,i,y}$: Quantity of charcoal produced and used	Monitored	tons	0.33
K	CF : Conversion factor wood to charcoal	AMS-II.G defaults, IPCC guidelines		6.00
L	$NCV_{charcoal} / NCV_{charcoal, default}$	Fixed		0.98
M	$SMG_{y,b}$	Default given in AMS-III.BG.		0.03
N	GWP_{CH_4}	Default IPCC value		25.00
Expected ER _{III.BG} per ICS for use of charcoal replacing charcoal		$J*((K*H*L*F*G)+(M*(0.9-F)*N))$	tCO ₂ /a	1.70
Possible total ER per ICS			tCO ₂ /a	4.24

F.2. Calculation of project emissions or actual net removals

>>Not applicable.

F.3. Calculation of leakage emissions

>>According to AMS-II.G para. 28 the default net to gross adjustment factor of 0.95 is applied to account for leakage and therefore surveys are not required.

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/2021	Total amount
CPA 1 CPA 10516-P1-0001-CP1	41,004	-	0	0	41,004	0	41,004
Total	41,004	-	0	0	41,004	0	41,004

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO ₂ e)
CPA 1 CPA 10516-P1-0001-CP1	41,004	55,883

Total	41,004	55,883
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F.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the CPA-DD”

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The amount estimated ex ante for this monitoring period in the CPA-DD was calculated using the ex-ante emission reduction calculation for the year 2020 as per the registered CPA DD. The total sum of ER for the year 2020 was divided by 365 and multiplied with the number of days of the Monitoring Period (67).

	<i>length MP (days)</i>	<i>ER</i>
2020	365	304,439
MP1	67	55,883

F.6. Remarks on increase in achieved emission reductions

>> Not applicable

F.7. Remarks on scale of small-scale CPAs

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Type II				Source of Data
AMS-II.G	MSc limit project activity	60	GWh therm.	Project Standard V.2.0 (CDM-EB93-A07-STAN, par. 128)
	Wood savings per TLUD	2.93	tons of fuelwood	Survey results for MP1
	Energy per ton of fuelwood	0.00433333	GWh/ton, derived from 0.0156 TJ/ton (0.0156 TJ/ton = 0.004333 GWh)	AMS-II.G, version 10, default value
	Energy savings per TLUD	0.0127	Gwh_{thermal}	Calculation

Type III				Source of Data
AMS-III.BG	MSc Limit project activity	20,000	tons of CO ₂	Project Standard V.2.0 (CDM-EB93-A07-STAN, par. 128)
	Quantity of Charcoal produced per ICS	0.33	tons/a	Monitored, preliminary value 20% of By,new,survey,y per stove
	CF (Wood to charcoal conversion factor)	6		AMS-III.BG, version 3
	Energy per ton of fuelwood	15.60	GJ/ton	AMS-II.G, version 10, default value
	NCV _{charcoal,i} / NCV _{charcoal,default}	0.98		Default value for NCVcharcoal according to AMS-III.BG
	fNRB	0.8718		calculation fNRB
	EF (emission factor)	0.0637	tons of CO ₂ per GJ	AMS-II.G, version 10, default value.
	SMG _{y,b}	0.03		AMS-II.G, version 10, default

				value
	GWP _{CH4}	25		AMS-II.G, version 10, default value
	Annual emission reduction per ICS	1.70	tCO ₂ /a	Calculation

Microscale thresholds are archived.

Document information

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04.0	6 April 2021	Revision to: <ul style="list-style-type: none"> • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
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