



**Monitoring report form for CDM programme of activities  
(version 01.0)**

**MONITORING REPORT**

<b>Title of the programme of activities (PoA)</b>	PoA for the Reduction of emission from non-renewable fuel from cooking at household level																			
<b>UNFCCC reference number of the PoA</b>	7359																			
<b>Version number(s) of the PoA-DD(s) applicable to this monitoring report</b>	13																			
<b>Coordinating/managing entity (CME)</b>	Green Development AS																			
<b>Version number of this monitoring report</b>	4																			
<b>Completion date of this monitoring report</b>	16/11/2016																			
<b>Monitoring period number and dates covered by this monitoring report</b>	<p>Monitoring period: 01</p> <table border="1"> <thead> <tr> <th></th> <th>Start of Monitoring Period</th> <th>End of Monitoring Period</th> </tr> </thead> <tbody> <tr> <td>7359-0035</td> <td>28/05/2014</td> <td>27/05/2016</td> </tr> <tr> <td>7359-0038</td> <td>28/05/2014</td> <td>27/05/2016</td> </tr> <tr> <td>7359-0039</td> <td>28/05/2014</td> <td>27/05/2016</td> </tr> <tr> <td>7359-0049</td> <td>28/05/2014</td> <td>27/05/2016</td> </tr> <tr> <td>7359-0052</td> <td>28/05/2014</td> <td>27/05/2016</td> </tr> </tbody> </table>			Start of Monitoring Period	End of Monitoring Period	7359-0035	28/05/2014	27/05/2016	7359-0038	28/05/2014	27/05/2016	7359-0039	28/05/2014	27/05/2016	7359-0049	28/05/2014	27/05/2016	7359-0052	28/05/2014	27/05/2016
	Start of Monitoring Period	End of Monitoring Period																		
7359-0035	28/05/2014	27/05/2016																		
7359-0038	28/05/2014	27/05/2016																		
7359-0039	28/05/2014	27/05/2016																		
7359-0049	28/05/2014	27/05/2016																		
7359-0052	28/05/2014	27/05/2016																		
<b>Monitoring report number for this monitoring period</b>	01																			
<b>Host Party(ies)</b>	Host Party(ies) of the PoA	Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)																		
	Federal Democratic Republic of Ethiopia	No																		
	Republic of Kenya	No																		
	Republic of Madagascar	No																		
	Republic of Malawi	Yes																		
	Republic of Mozambique	No																		
	Federal Republic of Nigeria	Yes																		
	Republic of Uganda	No																		

	Republic of Zambia Republic of Chad Dominican Republic Ivory Coast Republic of Liberia Republic of Namibia Republic of Rwanda Republic of Sierra Leone Republic of Somalia Republic of Ghana Republic of Zimbabwe Federal Republic of Somalia Republic of South Africa	No No No No No No No No No No No No
<b>Sectoral scope(s)</b>	Sectoral Scope: 01 Energy industries (renewable - / non-renewable sources)	
<b>Selected methodology(ies)</b>	AMS I.E., Version 04 - Switch from Non-Renewable Biomass for Thermal Applications by the User	
<b>Selected standardized baseline(s)</b>	None	
<b>Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case CPAs in the PoA covered in this monitoring report</b>	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	
	7359-0035	0 tCO <sub>2</sub> e
	7359-0038	0 tCO <sub>2</sub> e
	7359-0039	0 tCO <sub>2</sub> e
	7359-0049	0 tCO <sub>2</sub> e
	7350-0052	0 tCO <sub>2</sub> e
	<b>Total</b>	<b>0 tCO<sub>2</sub>e</b>
	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards	
		0 tCO <sub>2</sub> e
		0 tCO <sub>2</sub> e
		0 tCO <sub>2</sub> e
		966,797 tCO <sub>2</sub> e
		2,331,825 tCO <sub>2</sub> e
		<b>3,298,622 tCO<sub>2</sub>e</b>

## PART I - Programme of activities

### SECTION A. Description of PoA

#### A.1. Brief description of the PoA

The goal of the PoA is to reduce the demand for wood and charcoal and to contribute to a sustainable development.

The purpose of the PoA is to use carbon finance for the dissemination of solutions that will reduce the use of non-renewable fuel for cooking. The project activity reduces CO<sub>2</sub> emission by replacing the use of non-renewable fuel for cooking with clean renewable fuel, and by providing solutions that provide clean drinking water to the households so that they do not need to boil water.

The technology and equipment include ethanol stoves, biogas stoves, and water purification systems. Only water purification systems have been included in the batch of CPAs included in this MR.

##### A.1.1. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	01 Energy industries (renewable - / non-renewable sources)	AMS I.E., Version 04 - Switch from Non-Renewable Biomass for Thermal Applications by the User

##### A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period	Title, identification/reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring report? (yes/no)
7359-0001	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	01/05/2013-31/12/2019	No (excluded)
7359-0002	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0003	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at	28/05/2014-27/05/2021	No (excluded)

	household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013		
7359-0004	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0005	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0006	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0007	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0008	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0009	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0010	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0011	Title: PoA for the Reduction of emission	28/05/2014-27/05/2021	No (excluded)

	from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013		
7359-0012	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0013	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0014	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0015	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0016	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0017	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0018	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)

7359-0019	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0020	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0021	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0022	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0023	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No (excluded)
7359-0024	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0025	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0026	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of	28/05/2014-27/05/2021	No

	PoA-DD, version 13, dated 14/12/2013		
7359-0027	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0028	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0029	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0030	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0031	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0032	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0033	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0034	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at	28/05/2014-27/05/2021	No

	household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013		
7359-0035	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	Yes
7359-0036	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0037	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0038	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	Yes
7359-0039	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	Yes
7359-0040	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0041	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014-27/05/2021	No
7359-0042	Title: PoA for the Reduction of emission	28/05/2014 – 27/05/2021	No



	from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013		
7359-0043	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0044	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0045	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0046	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0047	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0048	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0049	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	Yes

7359-0050	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0051	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0052	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	Yes
7359-0053	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0054	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0055	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0056	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	28/05/2014 – 27/05/2021	No
7359-0057	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of	28/05/2014 – 27/05/2021	No

	PoA-DD, version 13, dated 14/12/2013		
7359-0058	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	01/07/2015 – 30/06/2022	No
7359-0059	Title: PoA for the Reduction of emission from non-renewable fuel from cooking at household level. Identification: Part II of PoA-DD, version 13, dated 14/12/2013	01/01/2015 – 31/12/2021	No

## A.2 Contact information of responsible person(s)/entity(ies)

Havard Norstebo  
Phone: +47 93630730  
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Wergelandsveien 27  
0167 Oslo  
Norway

The responsible person for filling out the MR is the same as CME as stated in appendix 1.

## SECTION B. Implementation of PoA

### B.1. Implementation of the management system of the PoA

The PoA was implemented in accordance with the CDM PoA DD.

Project activities was implemented with a number of Local Project Implementation Partners in each of the CPAs in which project activities has been implemented.

The local Project Implementation Partners (LPIP) provide the solutions to the Project Participating household. The LPIP registered the Project Participating households with the standard end user contract provided by CME. The end-user contract was then forwarded to CME for registration.

CME has contracts with the LPIP stipulating how the income from the carbon credits will be shared between CME and LPIP.

The standard end user contract was provided in two formats, as specified in the CDM PoA DD:

1. Written end user contract
2. Smart phone application

All the project participating households is then registered in an electronic database where all project participating households is provided with a unique ID and where all relevant information is stored, including:

- Unique ID
- Name of representative for project participating household
- Address of project participating household
- CPA
- LPIP
- Date of registration
- Type of solution provided
- Person responsible for the end user to be filled out (LPIP)
- Phone number, when available
- Picture of representative from Project Participating household (only available for households registered with smart phone application)

The selection of households to be monitored was done by CME in accordance with the CDM PoA monitoring description. All the households registered in the CPAs included in this monitoring report was copied into a spreadsheet and then the random selection function in excel was used to select the households to be monitored.

### **Deployed solutions**

All the households included in the program and in which ER is claimed is using purified water from community based water supply systems as described in the CPA DD section D.5, paragraph 1, b, "Community based water purification system". Technical description of the water supply systems as well as confirmation that the water quality meet the required quality has been provided in appendixes to this MR.

It has been confirmed through the monitoring of the representative sample of households, that all households have been included in the program after the start date of the program, that all the systems are operational and that the households confirm that they are part of the program<sup>1</sup>.

### **Registration of project participating households.**

Households are registered by a standardized end user contract or with a smart phone application. As the use of the smart phone application was only explicitly approved in the PRC of CDM PoA DD on 10/02/14, the households registered prior to this date was mainly registered with paper based end-user contracts, and most of the households included in the program after this date has been registered with a smart phone application.

Some households have been removed from the program, due to irregularities found in the registration process. This include households using biogas stoves and ethanol stoves in Malawi. These households was removed from the program due to irregularities with the registration.

All the households included in the program have been registered in the program by a representative from our Local Project Implementation Partners.

**Determination of Technology days.** This was not stated in the CDM PoA DD, but has been done to reduce the risk of overestimating emission reduction. This is therefore conservative.

As some project participating households were included after the start of the monitoring period, a process had been added to take this into account, so as to avoid claiming carbon credits for the

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<sup>1</sup> Monitoring was carried out by 3<sup>rd</sup> party consultants. The 3<sup>rd</sup> party consultants that carried out the monitoring is not employed by CME or any companies associated with CME or any of the Project Implementation Partners. The consultants that carried out the monitoring is only engaged by CME to conduct the monitoring and to support quality assurance processes when the Local Project Implementation Partners fail to provide such support as required. The consultants have received training and instruction on how to carry out the monitoring and which households that should be monitored.

days before these households were included in the program. This was done by calculating the average number of days in which emission reduction has been achieved by households during the monitoring period.

Number of days from the start of the monitoring period on 01/07/2014 to the end of the monitoring period on 27/05/2016 is 730<sup>2</sup>. As all households included in the CPAs included in this MR was included in the CPAs with has a start date of 28/05/2014, this is the effective start date in which ER could be claimed.

Of the 76,164 households included in the program by the end of the monitoring period. All the households added after the start of the monitoring period, had less than 730 days in which ER is achieved and as result the average number of days in which ER is achieved was reduced to 679 days, which is the average number of technology days in which emission reduction is claimed from each household.

Please see tab “HH with Technology Days” cell W-76168 for calculation of technology days.

The value of 679, which is the number of days in which we claim ER from each project participating household” is used in the following formula to calculate ER.

- a.  $HG_{biogas,y}$  (Not applicable as no biogas systems is included in the CPAs monitored)
- b.  $HG_{Denatured\ Alcohol,y}$  (Not applicable as no ethanol stoves used by the CPAs monitored).
- c.  $B_{y,Water}$

See “Appendix 1 – spreadsheet”, tab “Monitoring Data”, formula in row 46. Implementation of single sampling plan(s)

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<sup>2</sup> <http://www.timeanddate.com/date/duration.html>

## CDM Team rejection of request for issuance from previous monitoring report

A monitoring report was prepared in 2014 and validated by TUV Nord. During the verification process carried out by TUV Nord, a number of issues was raised, which has been taken into consideration during monitoring of the monitoring period covered by this Monitoring Report.

The request for issuance for the Monitoring Report verified by TUV Nord was reported as incomplete by the CDM Team for a number of reason, which the CDM Team was of the opinion that was not sufficiently well clarified how was validated. As TUV Nord failed to reply to these issues in an appropriate time, the MR and the request for issuance was requested to be withdrawn. This monitoring report hence seek to clarify the issues raised by the CDM team during their issuance process, and which might be relevant for this monitoring report. This include.

- Confirming that the deployed technology is in compliance with the Methodology. CME has double checked that the technology is in compliance with the methodology, and that human power used to operate a hand-pumped borehole is considered renewable energy. The issue was also raised to the Regional Collaboration Centre in Lome, which confirmed that it was also their opinion that the deployed technology was in compliance with the methodology and that the use of human power was considered renewable energy.
- Confirming that the deployed technology is in compliance with the CDM PoA DD and the CPA DDs. CME has specified in the PoA DD that the technical description of the community based water purification referred to in the PoA DD only referred to the technology to be deployed by the first CPA. The PoA further specified that other technologies might be deployed by other CPAs that would be registered after the registration of the PoA DD. Furthermore, the PoA DD specify the technical requirements for the water purification systems that might be deployed in future CPAs in the Eligibility Criteria. The Technical solutions deployed in the CPAs included in this CPA all comply with the technical requirements as specified in the Eligibility criteria. Hence it is concluded that the deployed technology is in compliance with the PoA DD and the CPA DDs in which the deployed solutions are part.
- CME has double checked that the formula for calculating the ER in accordance with the Validated PoA DD and CPA DDs are correct with regards to the  $C_p$  (portion of woody biomass that is used in the form of charcoal in the project area) and CCF (Charcoal Conversion Factor). CME is hence confirming that it is correct that the CCF values should be placed as a multiplier (Numerators) and that is should not be placed as a denominator as implied by the request for clarification from the CDM team in their mail to TUV Nord on 19/08/2016.
- All the other issues raised by the CDM Team of the UNFCCC has either been corrected prior to preparation of this Monitoring Report or is not relevant for this monitoring report.

The Monitoring Report that was verified and submitted to the CDM Team with a request for issuance in 2015 was named Monitoring Report 1. This Monitoring Report is also called Monitoring Report 1, as the previous Monitoring Report has been rejected and no issuance has been made for any Monitoring Report issued prior to this Monitoring Report and previously submitted MRs has been withdrawn.

Monitoring has been carried out in 2014 and in 2016. The time between the two monitoring processes was due to the long time it took to validate the first monitoring report that was later withdrawn. Delay in the issuance process in later 2015 also prevented the monitoring to start again until 2016. As the first monitoring process that was carried out in 2014 had to be dismissed due to Material Errors, only the monitoring carried out in 2016 is used for the calculation of ER in this Monitoring Report. CME would also like to point out that the Methodology or the PoA DD has no reference to the required frequency of preparing a Monitoring Report or for the frequency of request for issuance from the program.

## B.2. Implementation of single sampling plan(s)

The single sampling plan was done for a batch of CPAs included in the PoA. This batch includes all CPAs in Nigeria and Malawi, and only includes CPAs where households have been provided with clean drinking water to reduce ER. No biogas systems or ethanol stoves are included in any of the CPAs monitored in this batch of CPAs.

As only one technology / Measure, in accordance with PoA DD section A6 paragraph 1, is deployed in the batch of CPAs included in this monitoring report, we used simple random sample for the selection of households to be monitored for emission reductions. The households were selected by the random selection function in excel. The sampling was done by the Data and Recording Manager of Green Development, and the process was witnessed by another employee of Green Development. Neither of the people involved with the sample selection process had any knowledge about where project activities have been implemented in Malawi or Nigeria and neither of them have ever been to either of these countries or have any involvement with the implementation of the projects at the time of selection of households to be sampled for monitoring.

85 samples were selected for the monitoring. This was the number of samples that was required to meet the required confidence level from the previous monitoring period.

**Table D.1 – Distribution of households selected for sampling**

CPA	Project participating households using:			Total
	Biogas Stoves	Ethanol Stoves	Purified Water	
7359-0035	0	0	0	<b>0</b>
7359-0038	0	0	0	<b>0</b>
7359-0039	0	0	0	<b>0</b>
7359-0049	0	0	28	<b>28</b>
7359-0052	0	0	57	<b>57</b>
<b>Total</b>	<b>0</b>	<b>0</b>	<b>85</b>	<b>85</b>

As no households is registered in CPA 7359-0035, 7359-0038 and 7359-0039, no households could be selected from these CPAs. As no households are registered as using biogas stoves or biogas stoves in any of the CPAs, there was no households selected for monitoring using these technologies.

The households selected for monitoring, with all the available information about each of these households can be found in the "Appendix 1 – spreadsheet" tab "Households selected for monitoring".

The list of the households selected for monitoring in Malawi was then sent to the external consultant responsible for monitoring in Malawi. The list of households selected for monitoring in Nigeria was sent to the external consultant responsible for monitoring in Nigeria.

### Required minimum sample size

The minimum required sample size were calculated in accordance with the CDM PoA-DD and the CPA-DDs. As the monitoring were done for a group of CPAs, the required confidence level should be 95/10. The formula to calculate the required sample size where:

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

Where:  $V = \left( \frac{SD}{mean} \right)^2$

n = Sample size – number of households needed to be included in sample.

N = Total number of households that can reply to a particular parameter

Mean= To be estimated or calculated prior to monitoring

SD= To be estimated or calculated prior to monitoring

1.96= Represents the 95% confidence required  
0.1= represents the 10% relative precision

**Table D.2 - Calculation of required sample size**

Monitored households nr.	1	2	84	85	Sum monitored	Average value	Standard Deviation	V-Value	Sample size required to achieve 95/10 confidence level	Actual samples size used for each of the parameters monitored	Calculation of lower bound of confidence level				
											Square root of sample size	Standard error	Margin of Error	Lower bound	Upper bound in proportion of mean
Unique ID household	Malawi - CPA-ML-002-820	Malawi - CPA-ML-002-3103	Nigeria - CPA-NI-003-53239	Nigeria - CPA-NI-003-53548											
<b>Monitored values</b>															
N <sub>DV</sub> (Number of people drinking purified water)	4	0	13	10	805.00	9.47	5.907	0.389	149.4	85	9.219544	0.640663	1.255699	8.21	0.867411
N <sub>DV</sub> adjusted for lower bound of confidence level	3.5	0.0	11.3	8.7	698.27	8.21									
QDW <sub>DV</sub> (Volume of water per person in drinking per day, in liter)	2.8	0.0	5.5	5.0	326.27	3.84	1.259	0.079	30.5	85					
Thermal output water purification system (Kw)	0.50	0.00	0.50	0.50	36.00	0.42	0.059	0.014	5.4	85					
W <sub>water</sub> (L/s except water that must be able to evaporate)	1	0	1	1	73.00	0.86	0.000	0.000	0.0	85					

The calculation for required sample sized is copied from “Appendix 1 - spreadsheet”, tab “Monitoring Data”.

As the average thermal output of each project participating household is 0.42 kW and a total of 76,164 household was included in the PoA, total installed thermal output is 31.99 MW, which is less than the threshold for a CPA. As total installed thermal capacity of all the CPAs included in this MR is less than the threshold for a single CPA it can be concluded the thermal output for each CPA is under the threshold of 45 MW. It could be argued that thermal output of the program should include the households in which no ER is claimed and if so that total thermal output of the CPAs included in this MR would be 0.5 kW times 76,164 household which would give a total thermal output of 38.08 MW, which is also under the small scale threshold of a single CPA.

As the required sample size for the parameter  $N_{py}$  (number of people (in each household) drinking purified water) is 149.4 and the actual sample size was 85, the sample size to achieve the required 95/10 confidence level was not reached. According to article 17 in the methodology, the PP might choose to use the lower bond of the confidence interval of the parameter value as an alternative to repeating the survey efforts. This is also in line with the “Guideline for sampling and survey for CDM project activities and programmes of activities<sup>3</sup>”.

The calculations to determine the lower bound is described in CDM-EB67-A06-GUID, in article 85 (Equation 8), as;

$$\text{Mean} \pm t_{(n-1)} \times \frac{SD}{\sqrt{n}}$$

Where:

n	=	Sample size, which is 85
Mean	=	Sample mean, which is 9.47
SD	=	Sample standard deviation, which is 5.907
$t_{(n-1)}$	=	Represent the relevant value from the t-distribution of (n-1) degree of freedom that is associated with 95% confidence. This value is 1.96 according to the table.

Calculations is hence:

$$9.47 \pm 1.96 \times \frac{5.907}{\sqrt{85}} = 9.47 \pm 1.96 \times 0.64 = 8.21 \text{ and } 10.73.$$

The lower bound is hence 8.21, which is  $8.21/9.47 = 0.867$  of the mean.

<sup>3</sup> CDM-EB67-A06-GUID. Article 83, page 105



As the average value of the parameters is not used for calculation of ER but rather the ER is calculated for each household selected for monitoring, the value of the parameter that did not have a sufficient sample size to meet the required confidence level was multiplied with 0.867 to account for the lower bound of the average value of the parameter. The values with the lower bound has therefore been included in the Appendix 1, tab "Monitoring Data" in row 12, "N<sub>py</sub> adjusted for lower bound of confidence interval". This line is then replacing row 11 "N<sub>py</sub> number of people drinking purified water" for the calculation of ER. The lower bound of the value reduced each of the monitored values with  $(1-0.867) = 13.3\%$  and hence total claimed ER is reduced by the same 13.3% as a result of this conservative adjustment to the monitored values.

## **SECTION C. Post-registration changes to the PoA (including the generic CPA(s))**

### **C.1. Corrections**

Was approved prior to commencement of first verification for the PoA.

These corrections included<sup>i</sup>:

- Correct from Ethanol to Denatured Alcohol to clarify that ethanol which has not been denatured will not be included in the program.
- Correction of spellings.
- Correction to clarify the required purified water standards.
- Correction with regards to end user agreements, specifying that the end user contract could be a contract generated by a smart phone application.
- Correction to the data management, specifying that data can be stored electronically.
- Correction related to reference to Program Management Manual. Reference to the Program Management Manual has been removed.
- Correction related to the stakeholder consultation, specifying that stakeholder consultation can be done without the assistance from 3rd parties.
- Corrections to the baseline scenario, specifying that emission reductions will only be claimed for getting purified water, where it can be confirmed from the end user contracts that the household did boil their water in the baseline scenario
- Corrections have been made to Appendix 1 in the CDM PoA DD with updated email address of contact person.
- Corrections have been made to annex 4 in the CDM PoA DD. Part of the annex has been removed as it is not correctly representing all CPAs in the CDM PoA.

Versions of the monitoring plan;

- Changes of sampling process of the monitoring process, the sampling process has been included.
- Change of the confidence level of the sample size. Specified that a higher level of confidence level, namely 95/10 should be used when a group of several CPAs are included in the same monitoring process.
- Change have been made in the definition of  $ET_{usage,y}$ . Specifying that the consumption of fuel should be multiplied with the purify of the fuel.
- Change related to sample size. Specifying that the sample size of 68 only rely to the required sample size for the baseline study.
- Change to the monitoring process. The monitoring process is no longer described in a separate Program Management manual, but is included in the PoA-DD.
- Change to the monitoring form. The monitoring form was update to include a confirmation that the households that get purified water as part of the program, no longer boil their water.
- Change has been made with regards to the representative sampling. The CDM PoA-DD was updated to reflect new standards and guidelines by the executive board.

Changes:

Two changes to the project design have been made, these two changes are:

- A: Changes to Eligibility Criteria 17
- B: Changes to Geographical boundary of the program.

Approval date and number: 10/02/2014, PRC-7359-001.

**C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration**

>>

Not applicable.

**C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline**

>>

Not applicable.

**C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA**

>>

Not applicable.

**C.5. Types of changes specific to afforestation and reforestation activities**

>>

Not applicable.

## **PART II - Specific-case component project activity(ies)**

### **SECTION D. Description of specific-case CPA(s)**

>>

**D.1. Brief description of implemented specific-case CPA(s)**

>>

The implemented project activity includes the distribution of water purification systems. Distribution of biogas stoves and ethanol stoves is also included as solutions which are part of the CDM PoA, but no households are using biogas stoves or ethanol stoves in the CPAs that are included in the batch of CPAs included in this monitoring report.

**1. Implementation status**

A total of 5 CPAs are included in the batch of CPAs that is part of this Monitoring Report. These are all the CPAs included in Nigeria and Malawi. All the households included in these two countries are registered with the national wide CPAs, and hence there are only two CPAs included in this batch of CPAs in which emission reduction is claimed. The other 3 CPAs have no projects implemented, and hence no emission reductions are claimed from any of these 3 CPAs.

A total of 76,164 households have been registered as project participating households in these CPAs. 38,964 of these households were registered as part of the program prior to the start of the monitoring period, and 37,200 households were registered as part of the program

during the monitoring period (See cell W76170). All the project participating households get purified water from community based water supply system based on boreholes<sup>4</sup>.

Out of the 76,164 households included in the program, 22,323 households are registered with CPA 7359-0049, which is the national wide CPA in Malawi. The remaining 53,841 project participating households is registered with CPA 7359-0052, which is the national wide CPA in Nigeria.

There is a quality assurance program for all the project activities. The local project implementation partners are responsible for ensuring quality of the program components, including provide support for repair and service of all the community based water supply systems. The 3<sup>rd</sup> party that is engaged to carry out the monitoring is also responsible for ensuring that the Local Project Implementation Partners provide the required service and support for the community based water systems, and the third party will provide such support to the community water supply systems, when the Local Project Implementation Partner fail to provide the required support. When the 3<sup>rd</sup> party provide such support, this is then paid by CME and the cost of this is then subtracted from the payment from the share of the CERs to be paid to the Local Project Implementation Partner that should have provide such support. The Local Project Implementation Partner has 5 days to initiate the required support or repair of community based water supply systems, before the 3<sup>rd</sup> party might provide such support and repair<sup>5</sup>.

### Relevant dates for the project activity

Table A.1.C

Start of process of preparing CDM PoA DD	15/05/2011
PoA registration date	30/11/2012
Start date of CPA7359-0052 (Nigeria)	15/01/2013
Start date of CPA 7359-0049 (Malawi)	10/01/2013
Date of latest version of PoA DD (PRC approval)	14/12/2013
Start of first crediting Period of CPAs registered in the program	28/05/2014
End of first Monitoring Period	27/05/2016

Monitoring for the households selected for monitoring for this monitoring report has been done in January and February 2016. The date in which each of the household were included in the program can be found in the spreadsheet under tab "HH with Technology days" in column I.

### D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)

>>

Location details of each CPA of the PoA are included below. In line with the MR filling guideline as contained in the MR Form, the following table provide details of Host Party, Region/state/province, etc., City/town/community, etc. and Physical/geographical location. These details are same as provided in the CPA DD of each registered CPA. It is not possible to provide details of all individual H/H or solutions implemented under the CPAs of the PoA, hence representative geo-coordinates has been provided.

The already implemented project activities in the 5 CPAs included in this monitoring report are in various locations throughout Nigeria and Malawi.

<sup>4</sup> See Appendix "Technical description of water pumps".

<sup>5</sup> In some cases, the water pump at the borehole is replaced or a new borehole is installed to increase the water supply to the project participating households in the community. When a water pump is beyond repair, a new water pump might be installed. This water pump will then replace the broken pump in the existing borehole, or alternatively a new borehole will be drilled to ensure that steady supply of drinking water.

## a. Host Party(ies);

CPA 7359-0035	Republic of Malawi
CPA 7359-0038	Federal Republic of Nigeria
CPA 7359-0039	Federal Republic of Nigeria
CPA 7359-0049	Republic of Malawi
CPA 7359-0052	Federal Republic of Nigeria

## b. Region/ State/ Province, etc.;

CPA 7359-0035	Lilongwe
CPA 7359-0038	State of Oyo
CPA 7359-0039	State of Delta
CPA 7359-0049	The CPA include all of Malawi
CPA 7359-0052	The CPA include all of Nigeria

The specific location of each household included in each of the CPAs are registered.

The address of each project participating household is recorded in the database of project participating households. See "Appendix 1 A – spreadsheet" tab "HH with Technology Days"

## c. City/ Town/ Community, etc.;

CPA 7359-0035	Lilongwe
CPA 7359-0038	State of Oyo
CPA 7359-0039	State of Delta
CPA 7359-0049	Project activity is not limited to any city, Town or Community but include households throughout Malawi
CPA 7359-0052	Project activity is not limited to any city, Town or Community but include households throughout Nigeria

## d. Physical/ Geographical location. The geo-co-ordinates as provided in the MR is representative geo-coordinate either for the host country or the region as specified in the registered CPA DD. The geographical reference can be found by simple web search and the use of Wikipedia

	Latitude	Longitude
CPA 7359-0035	-13.9832	33.7833
CPA 7359-0038	7.4068	3.8933
CPA 7359-0039	5.5	6
CPA 7359-0049	-13.2543	34.3015
CPA 7359-0052	9.0819	8.6752

**SECTION E. Post-registration changes to specific-case CPA(s)****E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

&gt;&gt;

Not applicable.

**E.2. Corrections**

&gt;&gt;

Not applicable

**E.3. Changes to the start date of the crediting period of the specific-case CPA(s)**

&gt;&gt;

No change to the start date of the crediting period has been applied to any of the specific case CPAs.

**E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration**

>>

Not applicable.

**E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline**

>>

No permanent changes to the monitoring plan has been requested.

**E.6. Changes to project design of the specific-case CPA(s)**

>>

There is no changes requested to the project design of any of the specific-case CPAs.

**E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)**

>>

Not applicable

**SECTION F. Description of the monitoring system of specific-case CPA(s)**

>>

The monitoring process included monitoring of emission reduction in all CPAs in the batch of CPAs included in this monitoring report. As project activity leading to emission reduction has only been achieved in 2 of the 5 CPAs included in this batch of CPAs, the monitoring process was limited to these 2 CPAs.

The monitoring system consisted of 3 major steps;

1. Registration of Project Participating households.
2. Monitoring of emission reduction from a sample of project participating households.
3. Multiply the average emission reduction calculated from the monitoring in point 2 above, with the total number of registered Project participating households in point 1 above.

**Step 1 - Registration of Project Participating Households**

The registration of project participating households was done by the Local Project Implementation Partners. A contract was signed with each project participating household and the contract information was then submitted to the CME Data Management Department. The contract was submitted in one of two optional formats:

1. By the use of a smart phone application. The registered data was then submitted automatically to the database of project participating households.
2. By a physical paper contract. The contract was then scanned and sent to the CME Data Management Department. The CME Data Management Department then registered the relevant data from the contract in the database of project participating households

Whenever a household has been registered in the database for project participating households, it was automatically given a Unique ID.

The registrations of households was done by the Local Project Implementation Partner.

**Illustration of the two solutions for registering households in the database of project participating households**

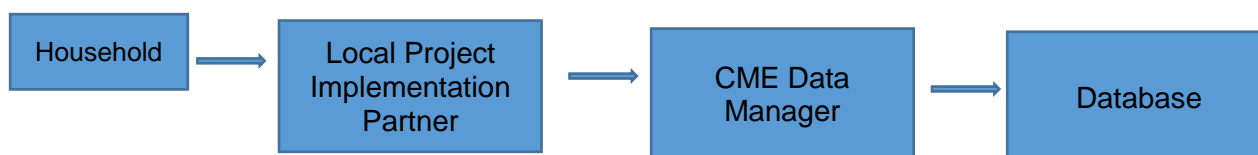
Data has been registered in the database by the use of one of the following two methods;

**Illustration C.1 – Registration of households with the use of smart phone application.**



Registration was done by the Local Project Implementation Partner by the use of a smart phone application that the Local Project Implementation Partner had installed in his or her smart phone.

**Illustration C.2 – Registration of households with the use of paper contract.**



The registration was done by the Local Project Implementation Partner with a paper contract. The paper contract was scanned and sent to CME Data Manager. The CME Data Manager register the data in the Database

The database of project participating households is continuously updated with new project participating households. The data has been copied from this database into a spreadsheet as backup and to be able to document the households registered at various times, including at the time of selection of households to be monitored and at the time of the request for verification.

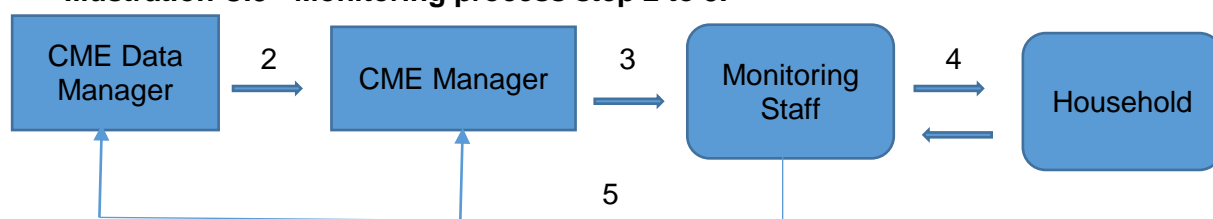
**Step 2 - Monitoring of emission reduction from sample of project participating households**

The monitoring of emission reduction from the sample of households was done according to the following process;

1. CME Manager decided on the time for monitoring.
2. CME Data Manager selected the sample of households to be monitored (in line with the provisions of monitoring plan of the PoA). The selection of households was done by simple random sample from all the project participating households registered in the CPAs in the batch of CPAs included in this monitoring report. The random selection function in Excel was used for selection of the households to be monitored.
3. Monitoring staff was informed about which households they should monitor.
  - a. The excel sheet with the households selected for monitoring, with all available information about each of these households was sent to the people responsible for monitoring in the two countries in which monitoring was done.
  - b. The monitoring staff was provided with training and instructions on how to conduct the monitoring process.
  - c. The monitoring staff was provided with the monitoring forms, and the equipment needed to carry out the monitoring and the list of household they should monitor.
4. Monitoring staff visited the households selected for sampling and carried out the monitoring process. The data collected from the monitoring process of each households was then registered in the monitoring form.
  - a. A representative from a certified water test laboratory came with the monitoring team to the selected households and to the community water point that provided water to these households.

5. The monitoring staff send the monitoring form for each household monitored to CME Data Manager, with CC to CME Manager. See “appendix 2 – Monitoring forms”
6. An independent 3<sup>rd</sup> party called each of the households monitored, and confirmed that the monitoring had been carried out and that the registered information provided in the monitoring forms was correct.
7. CME Data Manager registered all the data from the monitoring forms in the spreadsheet for calculation of emission reduction. See “Appendix 1 – Spreadsheet” tab “Monitored data”.
8. CME Data Manager send the spreadsheet for calculating emission reduction to CME Manager. The CME Manager used the data from this spreadsheet to calculate emission reduction from the project activities.

**Illustration C.3 - Monitoring process step 2 to 5.**



The households selected for sampling were selected from the 2 CPAs in which project activity had started at the time of selection of households.

**Table C.1 - Distribution of households sampled for emission reduction:**

	Ethanol stoves	Biogas stoves	Purified Water	Total
CPA 7359-0035	0	0	0	0
CPA 7359-0038	0	0	0	0
CPA 7359-0039	0	0	0	0
CPA 7359-0049	0	0	28	28
CPA 7359-0052	0	0	57	57
<b>Total</b>	<b>0</b>	<b>0</b>	<b>85</b>	<b>85</b>

Monitoring included both of the 2 CPAs in the batch of CPAs in which emission reductions have been achieved. The monitoring process and the tools used for monitoring were the same for all the households selected for monitoring.

### **Step 3 - Multiplying the average emission reduction calculated from the monitoring, with the total number of registered Project participating households**

Emission reduction from the project activities for the claimed monitoring period was determined by multiplying the average emission reduction from each of the households monitored, with the total number of households registered in the database of project participating households at the time of request for monitoring.

## SECTION G. Data and parameters

## G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period

Data/parameter	$f_{NRB,y}$
Unit	Fraction
Description	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass.
Source of data	<p>CPA 7359-0035 EB 67, annex 22 “Information note default values of fraction of non-renewable biomass for least developed countries and small island developing states”.</p> <p>CPA 7359-0038 <a href="http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf">http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf</a> (CDM SSC WG- Thirty-seventh meeting Report Annex 14)</p> <p>CPA 7359-0039 <a href="http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf">http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf</a> (CDM SSC WG- Thirty-seventh meeting Report Annex 14)</p> <p>CPA 7359-049 EB 67, annex 22, “Information note default values of fraction of nonrenewable biomass for least developed countries and small island developing states”.</p> <p>CPA 7359-0052 <a href="http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf">http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf</a> (CDM SSC WG- Thirty-seventh meeting Report Annex 14)</p>
Value(s) applied	<p>CPA 7359-0035 – 0.81</p> <p>CPA 7359-0038 – 0.93</p> <p>CPA 7350-0039 – 0.93</p> <p>CPA 7359-0049 – 0.81</p> <p>CPA 7359-0052 – 0.93</p>
Choice of data or measurement methods and procedures	Nationally approved methods. If no nationally approved methods are available to determine $f_{NRB}$ , Default values might be used for the Least Developed Countries included in the SSC PoA.
Purpose of data	To calculate emission reductions.
Additional comments	None

Data/parameter	$EF_{\text{projected\_fossilfuel}}$
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable biomass that is substituted.
Source of data	Default value in methodology. See section B.6.2 PoA DD
Value(s) applied	81.6
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

Data/parameter	$NCV_{\text{biomass}}$
Unit	TJ/tonne
Description	Net Calorific Value of the non-renewable biomass that is substituted.
Source of data	Default value in methodology. See section B.6.2 PoA DD



Value(s) applied	0.015
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	No biomass has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	NCV <sub>denatured alcohol</sub>
Unit	TJ / m <sup>3</sup>
Description	Energy Content of denatured alcohol.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas inventories combined with default density of ethanol. See section B.6.2 PoA DD
Value(s) applied	0.0213
Choice of data or measurement methods and procedures	<p>"Pure ethanol and alcoholic beverages are heavily taxed as a psychoactive drug, but ethanol has many uses that do not involve consumption by humans. To relieve the tax burden on these uses, most jurisdictions waive the tax when an agent has been added to the ethanol to render it unfit to drink. These include bittering agents such as denatonium benzoate and toxins such as methanol, naphtha, and pyridine. Products of this kind are called denatured alcohol".</p> <p><a href="http://en.wikipedia.org/wiki/Ethanol">http://en.wikipedia.org/wiki/Ethanol</a></p> <p>Denatured alcohol will consist mostly Ethanol. Net calorific value of ethanol is 27.0 TJ/Gg according to 2006 IPCC Guidelines for National Greenhouse Gas inventories. Volume 2 – Energy, Chapter 1 – Introduction, Table 1.2 "Default Net Calorific Values (NCVs)".</p> <p>Density of ethanol is 0.789 g/cm<sup>3</sup> <a href="http://en.wikipedia.org/wiki/Ethanol">http://en.wikipedia.org/wiki/Ethanol</a></p> <p>NCV for ethanol is hence calculated as (27.0 * 0.789 / 1000) = 0.0213 TJ / m<sup>3</sup></p> <p>Denatured alcohol will consist of a mix of ethanol and other types of alcohol or toxins or bittering agents. Ethanol or methanol shall always be the predominant type of fuel in the denatured alcohol mix that will be used by the project.</p>
Purpose of data	Calculation of baseline emissions.
Additional comments	No denatured alcohol has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	NCV <sub>biogas</sub>
Unit	TJ/m <sup>3</sup>
Description	Energy content of the biogas.
Source of data	IPCC default value. See Section B.6.2 PoA DD
Value(s) applied	0.000215

Choice of data or measurement methods and procedures	<p>Default energy value of biogas is used in other methodologies. AMS-I.I</p> <p>“Biogas/biomass thermal application for households/small users” version 02, 615. The default value a is described as;</p> <p>“Net calorific value of the biomass (GJ/unit mass or volume, dry basis). For biogas, use default value: 0.215 GJ/m<sup>3</sup> biogas (assuming NCV of the methane: 0.359 GJ/m<sup>3</sup>, default methane content in biogas: 60%)”</p> <p>0.215 GJ/m<sup>3</sup> equals 0.000215 TJ/m<sup>3</sup></p> <p><a href="http://cdm.unfccc.int/methodologies/SSCmethodologies/approved">http://cdm.unfccc.int/methodologies/SSCmethodologies/approved</a></p>
Purpose of data	Calculation of baseline emissions.
Additional comments	No biogas has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction in the CPAs included.

<b>Data/parameter</b>	NCV <sub>Charcoal</sub>
Unit	TJ/Tonne
Description	Energy content of Charcoal.
Source of data	IPCC default value. See Section D.6.2 PoA DD
Value(s) applied	0.0295
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

<b>Data/parameter</b>	$\eta_{old}$
Unit	Fraction.
Description	Efficiency of system being replaced.
Source of data	Baseline survey. See section D.6.2 CPA DD
Value(s) applied	CPA 7359-0035: 0.10 CPA 7359-0038: 0.10 CPA 7359-0039: 0.10 CPA 7359-0049: 0.10 CPA 7359-0052: 0.1074
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

<b>Data/parameter</b>	WB <sub>LB</sub>
Unit	Kg/litre
Description	Mass of woody biomass that would have been required to boil one litre of water.
Source of data	Laboratory test. See Section D.6.2 PoA DD
Value(s) applied	0.4356
Choice of data or measurement methods and procedures	Water boiling test done according to standard procedures.
Purpose of data	Calculation of baseline emissions.

Additional comments	None
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<b>Data/parameter</b>	WB <sub>LB,Charcoal</sub>
Unit	Kg/litre
Description	Mass of Charcoal that would have been required to boil one litre of water.
Source of data	Laboratory test. See Section D.6.2 PoA DD
Value(s) applied	0.2041
Choice of data or measurement methods and procedures	Water boiling test done according to standard procedures.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

<b>Data/parameter</b>	C <sub>CF</sub>
Unit	Number
Description	Charcoal conversion factor.
Source of data	Protecting and restoring forest carbon in tropical Africa, Chapter 6: Woodfuels and forests in tropical Africa
Value(s) applied	10
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

<b>Data/parameter</b>	C <sub>P</sub>
Unit	Fraction.
Description	Portion of woody biomass used in the form of Charcoal in project area.
Source of data	Baseline survey. See Section D.6.2 CPA DD
Value(s) applied	CPA 7359-0035 - 0.65 CPA 7359-0038 - 0.61 CPA 7359-0039 - 0.53 CPA 7359-0049 - 0.8153 CPA 7359-0052 - 0.6667
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

<b>Data/parameter</b>	LF
Unit	Fraction
Description	Net to gross adjustment factor of 0.95 to account for leakage.
Source of data	Default value in methodology. See section B.6.2 PoA DD
Value(s) applied	0.95
Choice of data or measurement methods and procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comments	None

<b>Data/parameter</b>	Thermal output of water purification systems
Unit	kW
Description	Thermal energy output from water purification system.
Source of data	Community water purification system product description. See section B.6.2 PoA DD
Value(s) applied	0.5
Choice of data or measurement methods and procedures	The value of 0.5 kW is based on the thermal output of the equipment used to boil the water, e.g. the baseline stoves. The value of 0.5 kW will be used as a default value in the program.
Purpose of data	Calculate the CPA thermal output to ensure that it is within the 45 MW limit for small-scale projects.
Additional comments	None

## G.2. Data and parameters monitored

<b>Data/parameter</b>	ET <sub>stoves, units,y</sub>
Unit	Number
Description	Average number of ethanol stoves used by project participating households in year y.
Measured/calculated/ default	Calculated
Source of data	Monitoring of a simple random sample of project participating households.
Value(s) of monitored parameter	0
Monitoring equipment	Not Applicable
Measuring/reading/ recording frequency	Annually monitoring
Calculation method (if applicable)	The value is found by adding the sum of the households using ethanol stoves in each of the CPAs included in the program. The data is provided from the database of all project participating households using the various technologies in each CPA. In these database the households are registered with which solutions they use.
QA/QC procedures	The number of households that use ethanol stoves in the project area has been cross checked with the sales records from the ethanol stove suppliers.
Purpose of data	Calculation of baseline emissions.
Additional comments	No ethanol stoves has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	ET <sub>usage,y</sub>
Unit	Litres
Description	Average daily denatured alcohol usage by project participating households in year y.
Measured/calculated/ default	Measured
Source of data	Monitoring of a simple random sample of project participating households.
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Measuring annually The monitoring took place during January 2016.
Calculation method (if applicable)	The usage of denatured alcohol has been physically recorded in a representative number of households over a period of 7 days.

QA/QC procedures	<p>The denatured alcohol consumption is based on pure ethanol. Hence the denatured alcohol used by the household was measured to determine its purity. If the NCV of the denatured alcohol is below that of the default <math>NCV_{denaturedAlcohol} 0.013 \text{ TJ/m}^3</math>, then the ET usage shall be adjusted for the lower NCV of the denatured alcohol used.</p> <p>If the NCV of the denatured alcohol used is 10% lower than the default value for <math>NCV_{denaturedAlcohol}</math> then the <math>ET_{usage,y}</math> shall be reduced by 10% relative to the measured volume of denatured alcohol used.</p> <p>The purity of the denatured alcohol has been measured and registered by the representative sample of households monitored for <math>ET_{usage,y}</math>.</p>
Purpose of data	Calculation of baseline emissions.
Additional comments	No denatured alcohol has been used by the project activities as the participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	$ET_{stove, Capacity,y}$
Unit	kW
Description	Average thermal capacity of ethanol stove used by the project participating households.
Measured/calculated/ default	Product description for each ethanol stove is has been used to determine its thermal capacity when this is available from stove suppliers. Alternatively, the thermal capacity of the stoves has been determined by a qualified laboratory.
Source of data	Monitored data
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable.
Measuring/reading/ recording frequency	Measuring annually
Calculation method (if applicable)	The average thermal capacity of ethanol stove used by the project participating household is calculated by adding the thermal capacity of the ethanol stoves used by the households selected for monitoring, and dividing this number with the number of households selected for monitoring.
QA/QC procedures	None
Purpose of data	Calculate the CPA thermal output capacity to ensure that it is within the 45 MW limit for small-scale projects.
Additional comments	No thermal energy from ethanol stove as a result of the project as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	$ET_{stove, Efficiency,y}$
Unit	Percentage
Description	Average thermal efficiency of ethanol stove used by the project participating household.
Measured/calculated/ default	Calculated
Source of data	Monitoring of a simple random sample of project participating households.
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Monitored annually
Calculation method (if applicable)	The average ethanol stove efficiency is calculated by adding the ethanol stove efficiency of the ethanol stoves used by the households selected for monitoring, and dividing this number with the number of households selected for monitoring.
QA/QC procedures	None
Purpose of data	Calculation of baseline emissions.

Additional comments	No ethanol stoves has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.
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<b>Data/parameter</b>	BG <sub>Stoves, units,y</sub>
Unit	Number
Description	Average number of biogas stoves used by project participating household in year y.
Measured/calculated/ default	Calculated
Source of data	Simple random sampling
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Reading
Calculation method (if applicable)	The value is found be the adding the sum of the households using ethanol stoves in each of the CPAs included in the program. The data is provided from the database of all project participating households using the various technologies in each CPA. In these database the households are registered with which solutions they use.
QA/QC procedures	Not applicable
Purpose of data	Calculation of baseline emissions.
Additional comments	No biogas stoves has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	BG <sub>usage,y</sub>
Unit	m <sup>3</sup>
Description	Average daily biogas usage per project participating household in year y
Measured/calculated/ default	Measured of a Simple random sample of project participating households.
Source of data	Monitoring of simple random sampling
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Monitoring from a simple random sample of project participants.
Calculation method (if applicable)	The average biogas usage is calculated by adding the biogas usage of the households selected for monitoring, and dividing this number with the number of households selected for monitoring.
QA/QC procedures	Biogas meters will be calibrated annually.
Purpose of data	Calculation of baseline emissions.
Additional comments	No biogas has been used by the project activities as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	BG <sub>stove, Capacity,y</sub>
Unit	kW
Description	Average thermal capacity of biogas stove used by the project participating households
Measured/calculated/ default	Calculated
Source of data	Measured of a simple random sample of project participating households.
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable.

Measuring/reading/recording frequency	Measuring annually
Calculation method (if applicable)	The average biogas stove capacity is calculated by adding the biogas stove capacity of the biogas stoves used by the households selected for monitoring, and dividing this number with the number of households selected for monitoring.
QA/QC procedures	None
Purpose of data	Calculate the CPA thermal output capacity to ensure that it is within the 45 MW limit for small-scale projects.
Additional comments	No biogas has been used by the project activities as the project t participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	$BG_{\text{stove, Efficiency, y}}$
Unit	Percentage
Description	Average thermal efficiency of biogas stove used by the project participating households.
Measured/calculated/ default	Calculated
Source of data	Monitoring of a simple random sample of project participating households.
Value(s) of monitored parameter	0
Monitoring equipment	Not applicable
Measuring/reading/recording frequency	Monitored annually The monitoring was done in January and February 2016.
Calculation method (if applicable)	The average biogas stove efficiency is calculated by adding the biogas stove efficiency of the biogas stoves used by the households selected for monitoring, and dividing this number with the number of households selected for monitoring.
QA/QC procedures	None
Purpose of data	Calculation of baseline emissions.
Additional comments	No biogas has been used by the project activities as the project as the project participating households in the batch of CPAs included in this monitoring report only used water system to achieve emission reduction.

<b>Data/parameter</b>	$N_{p, y}$
Unit	Number
Description	Average number of people in project participating households drinking purified water provided by the equipment supplied by the program.
Measured/calculated/ default	Calculated
Source of data	Monitoring of a simple random sample of project participating households.
Value(s) of monitored parameter	9.47
Monitoring equipment	Not applicable
Measuring/reading/recording frequency	Monitored annually The monitoring was done in January and February 2016
Calculation method (if applicable)	The number of people in the households drinking purified water is calculated by multiplying the number of people in households drinking purified water with the number of households provided with purified water.  9.47 is the average number of people in households provided with purified water 76164 is the number of households provided with purified water  $9.47 * 76164 = 721,273$ people provided with purified water as a result of the project activities.
QA/QC procedures	None
Purpose of data	Calculation of baseline emissions.

Additional comments	<p>The 95/10 confidence/precision has been used to determine minimum required sample size in accordance with paragraph 20, CDM-EB74-A06. As this confidence/precision level was not reached, the lower bound of the confidence level was used. This reduced each monitored value with 11.5%.</p> <p>The average value monitored was 9.47 people in each household monitored, but this value was reduced to 8.21 people to be conservative and account for the lower bound of the confidence level.</p> <p>The number of people in each households is relatively large, this is due to the fact that the households included in the project, and which get purified water from boreholes are poor people which tend to have large families. Moreover, many of the households were monitored in Muslim areas in which the man of the house could have several wives and therefore many children and hence very large number of people in the household.</p>
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<b>Data/parameter</b>	QDW <sub>p,y</sub>
Unit	Litre/Day
Description	Average number of litre of purified water used by each person in project participating households in year y.
Measured/calculated/ default	Monitoring of a simple random sample of project participating households.
Source of data	Monitoring of a simple random sample of project participating households.
Value(s) of monitored parameter	3.84
Monitoring equipment	Water containers
Measuring/reading/ recording frequency	Monitored annually The monitoring was done in January and February 2016.
Calculation method (if applicable)	The average drinking water consumption for each person is calculated by water consumption per household divided by number of people in the households.
QA/QC procedures	The value has been capped at 5.5, in accordance with the methodology.
Purpose of data	Calculation of baseline emissions.
Additional comments	<p>The 95/10 confidence/precision has been used to determine minimum required sample size in accordance with paragraph 20, CDM-EB74-A06.</p> <ul style="list-style-type: none"> <li>• In total 76,164 households are provided with clean water.</li> <li>• In total 721,273 people are provided with clean water.</li> <li>• In total 2,769,688 litre of water was used each day by the people in the households provided by clean water as a result of the project activities.</li> <li>• In total 1,010,936,350 litre of clean water was used by the people in the households included in the projects during the monitoring period.</li> </ul>

<b>Data/parameter</b>	W <sub>Quality,y</sub>
Unit	Yes or No
Description	Water Quality – to conform that purified water meet national or WHO interim microbiological standards for drinking water in year y.
Measured/calculated/ default	Calculated
Source of data	Monitoring of a simple random sample
Value(s) of monitored parameter	1.00 average value samples
Monitoring equipment	Laboratory test
Measuring/reading/ recording frequency	Annual Monitoring The monitoring was done in January and February 2016
Calculation method (if applicable)	



QA/QC procedures	<p>To ensure compliance of the microbiological water quality either with:</p> <ul style="list-style-type: none"> <li>• The community microbiological water purification systems shall provide purified water that meet applicable national microbiological standards/guidelines or WHO's interim performance targets on water treatment, and have energy output of less than 50 kW.</li> <li>• The Household microbiological water purification systems shall provide purified water that meet applicable national microbiological standards/guidelines or WHO's interim performance target on household water treatment.</li> </ul> <p>The water quality was monitored on sample basis for contamination with thermotolerant (faecal) coliforms or coli (E. coli). A presence/absence test for E. coli colony forming units (CFU) of more than 100 units per 100 ml of water or an equivalent quantitative test for E. coli CFU was used. A presence of up to 100 E. coli CFU/100 ml was perceived to be acceptable in accordance with the POA DD.</p>
Purpose of data	Calculation of baseline emissions.
Additional comments	<p>All the drinking water that was provided by the program was found to meet the required quality.</p> <p>The 95/10 confidence/precision has been used to determine minimum required sample size in accordance with paragraph 20, CDM-EB74-A06.</p> <p>All the households sampled and which ER could be claimed, got water that met the quality standard as required by the national standard and the WHO intermediate standard as specified in the PDD.</p> <p>As some households selected for monitoring could not be monitored, the average value of all the households selected for monitoring would be 0.86 when a value of 0 is applied to those households that could not be monitored.</p>

### G.3. Implementation of specific-case CPA level sampling plan

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Not applicable.

## SECTION H. Calculation of GHG emission reductions or net GHG removals by sinks

### H.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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Please note that the methodology AMS I.E version 4 does not provide specific equations for calculation of baseline emission or leakage, only for emission reductions. The emission reduction is calculated the following:

**Emission reductions would be calculated as:**

$$ER_y = ER_{y, \text{Denatured alcohol}} + ER_{y, \text{Biogas}} + ER_{y, \text{Water}}$$

Where

$$ER_{y, \text{Denatured alcohol}} = B_{y, \text{Denatured alcohol}} * f_{NRB, y} * NCV_{\text{biomass}} * EF_{\text{projected\_fossilfuel}}$$

$$ER_{y, \text{Biogas}} = B_{y, \text{Biogas}} * f_{NRB, y} * NCV_{\text{biomass}} * EF_{\text{projected\_fossilfuel}}$$

$$ER_{y, \text{Water}} = B_{y, \text{Water}} * f_{NRB, y} * NCV_{\text{biomass}} * EF_{\text{projected\_fossilfuel}}$$

$ER_y$  = Emission reductions during the year y, in tCO<sub>2</sub>e

$B_y$  = Quantity of biomass that is substituted or displaced in tonnes

$f_{NRB, y}$  = Fraction of biomass used in the absence of the project activity in

year y, that can be established as non-renewable biomass.

$NCV_{biomass}$  = Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonnes)

$EF_{projected\_fossil\ fuel}$  = Emission factor for the substitution on non-renewable biomass by similar consumers. Use a default value of 81.6 tCO<sub>2</sub>/TJ

### Step 1: By is determined:

$B_y$ , must be calculated separately for the stoves (ethanol and biogas) and for the purified water consumed.

Hence  $B_y$  is the sum of  $B_{y,biogas} + B_{y,Denatured\ alcohol} + B_{y,purifiedWater}$  ;

$$B_{y,Biogas} = (((HG_{p,y,Biogas} / (NCV_{biomass} * \eta_{old})) * (1 - C_P)) + ((HG_{p,y,Biogas} / (NCV_{Charcoal} * \eta_{old})) * (C_P * C_{CF}))) * LF$$

$$B_{y,Denatured\ alcohol} = (((HG_{p,y,Denatured\ alcohol} / (NCV_{Biomass} * \eta_{old})) * (1 - C_P)) + ((HG_{p,y,Denatured\ alcohol} / (NCV_{Charcoal} * \eta_{old})) * (C_P * C_{CF}))) * LF$$

$$B_{y,PurifiedWater} = (((N_{p,y} * QDW_{p,y} * WB_{LB} * 365 * 10^{-3}) * (1 - C_P)) + ((N_{p,y} * QDW_{p,y} * WB_{LB,Charcoal} * 365^6 * 10^{-3}) * (C_P * C_{CF}))) * LF * W_{qualify,y}$$

Where:

$B_{y,Biogas}$  = Quantity of woody biomass that is substituted or displaced in ton as a result of the biogas used by the project in year y.

$HG_{p,y,Biogas}$  = Quantity of thermal energy generated by the biogas used the project participating households in year y measured in TJ.

$NCV_{Biomass}$  = Net Calorific Value of the non-renewable woody biomass that is substituted.

$NCV_{Charcoal}$  = Net Calorific Value of the non-renewable woody biomass that is used in the form of charcoal and which is substituted.

$\eta_{old}$  = Efficiency of the old stoves that has been replaced by the project.

$B_{y,Denatured\ alcohol}$  = Quantity of woody biomass that is substituted or displaced in ton as a result of the denatured alcohol used by the project in year y.

$HG_{p,y,Denatured\ alcohol}$  = Quantity of thermal energy generated by the denatured alcohol used by the project participating households in year y, measured in TJ.

$B_{y,PurifiedWater}$  = Quantity of woody biomass that is displaced in ton as a result of the purified water replacing the need to boil water.

$N_{p,y}$  = Total number of people in the project area that get purified water as a result of the project activity.

$QDW_{p,y}$  = Volume of drinking purified water in litres per person per day.

$WB_{LB}$  = Mass of woody biomass that would have been required to boil one litre of water (kg/litre).

$WB_{LB,Charcoal}$  = Mass of woody biomass that is used in the form of charcoal that has been required to boil one litre of water (kg/litre).

$C_{CF}$  = Charcoal Conversion Factor

$C_P$  = Portion of woody biomass that is used in the form of charcoal in the project area.

$LF$  = Net to gross adjustment factor of 0.95 to account for leakage.

<sup>6</sup> 365 is the value used in the CDM PoA DD and CPA DD and this refers to the number of days in a year. This value has been replaced with 679 which is the number of days the average household has been part of the program during the monitoring period. In "Appendix 1 – Spreadsheet", tab "Monitored data", this value can be found in the formula in the cells in row 46.

$W_{\text{quality},y}$  = Portion of purified water that meet WHO standards for drinking water in year y.

## Step 2. $HG_{p,y}$ is determined

### $HG_{p,y}$ calculations;

$$HG_{p,y,\text{Biogas}} = NCV_{\text{Biogas}} * BG_{\text{Usage},y} * BG_{\text{Stoves,Units},y} * (BG_{\text{stove,efficiency}} / 100) * 365$$

$$HG_{p,y,\text{Denatured alcohol}} = NCV_{\text{Denatured alcohol}} * ET_{\text{Usage},y} / 1000 * ET_{\text{Stoves,Units},y} * (ET_{\text{stove,efficiency}} / 100) * 365$$

Where

$HG_{p,y}$  = Quantity of thermal energy generated by the new renewable energy technology in the project area in year y (TJ).

$NCV_{\text{Biogas}}$  = Net Calorific Value of Biogas. Based on default value.

$BG_{\text{Usage},y}$  = Average Biogas usage in m3 per day per in year y (multiplied by 365 to get annual consumption per user).

$BG_{\text{Stoves,Units},y}$  = Biogas stoves in use in the project area in year y.

$NCV_{\text{Denatured alcohol}}$  = Net Calorific Value of denatured alcohol. Based on default value.

$ET_{\text{Usage},y}$  = Average denatured alcohol usage per litre per household in year y. Divided by 1000 to get value in m<sup>3</sup>.

$ET_{\text{Stoves,Units},y}$  = Ethanol stoves in use in the project area in year y.

## Step 3. Determine the average emission reduction from project participating households.

Emission reduction is calculated from the project participating households selected for monitoring. The total emission reduction from these households is divided by the number of households that has been subject to sampling in order to determine the average emission reduction per project participating household.

The calculations of the emission from each of the 85 households monitored has been submitted to DOE as supporting document to this Monitoring Report.

### Confirming that the project activity is within the small scale threshold

According the Eligibility Criteria in Section D.5 of the CPAs, the thermal output of the project activities in each CPA should be capped at 45 MW. Each of the monitored households using purified water from community based water supply systems in each of the CPAs, used water from a system which is defined as having a thermal output of 0.5 kW. Hence up to  $45,000 / 0.5 = 90,000$  households using purified water could be included in each CPA as none of the households use any other solutions which is part of the program, such as biogas or ethanol stoves. All the CPAs in which ER is claimed as part of this MR has less than 90,000 households registered, and hence it can be confirmed that the thermal output of the project activities are within the threshold specified in the CPA DDs.

Table H.1 – Table for calculations of emission reductions

Monitored households nr.	1	2	84	85		
	Malawi - CPA-ML-002-002-002	Malawi - CPA-ML-002-002-002	Nigeria- CPA-NI-003-003-003	Nigeria- CPA-NI-003-003-003		
Unique ID household	820	3103	53239	53548	Sum monitored	Average value
<b>Monitored values</b>						
N <sub>p,y</sub> (Number of people drinking purified water)	4	0	13	10	805.00	9.47
N <sub>p,y</sub> adjusted for lower bound of confidence level	3.5	0.0	11.3	8.7	698.27	8.21
QDW <sub>p,y</sub> (Volume of water per person is drinking per day, in liter)	2.8	0.0	5.5	5.0	326.27	3.84
Thermal output water purification system (Kw)	0.50	0.00	0.50	0.50	36.00	0.42
W <sub>quality</sub> (1 represent water that meet quality requirement)	1	0	1	1	73.00	0.86
<b>Predetermined values</b>						
f <sub>NRB,y</sub> (ratio of biomass which is non-renewable)	0.81	0.81	0.93	0.93		
n <sub>old</sub> (average efficiency of old stoves)	0.1	0.1	0.1074	0.1074		
C <sub>P</sub> (Fraction of non-renewable biomass used as charcoal)	0.82	0.82	0.67	0.67		
C <sub>CF</sub> (number of kg of wood needed to make a kg of charcoal)	10	10	10	10		
NCV <sub>biomass</sub> (TJ / tonne)	0.015	0.015	0.015	0.015		
NCV <sub>Charcoal</sub> (TJ / tonne)	0.0295	0.0295	0.0295	0.0295		
EF <sub>projected_fossilfuel</sub> (tCO <sub>2</sub> /TJ)	81.6	81.6	81.6	81.6		
LF (Fraction to account for leakage)	0.95	0.95	0.95	0.95		
WB <sub>LB</sub> (Kg/Litre)	0.44	0.44	0.44	0.44		
WB <sub>LB,Charcoal</sub> (Kg / Litre)	0.20	0.20	0.20	0.20		
<b>Calculations</b>						
B <sub>y,water</sub> (Tonne)	10.88	0.00	60.25	41.89		
B <sub>y,project</sub> (Tonne)	10.88	0.00	60.25	41.89		
ER <sub>y,ProjectTotal</sub> (CO <sub>2</sub> e)	10.78	0.00	68.58	47.68	3681.31	Sum monitored
					43.31	Average monitored
<b>Default values</b>						
Figures to be determined prior to project implementation						
Figures from customer database						
Figures from annually monitoring						

For further details about the table above, and the calculations of the emission reductions, please see “Appendix 1 – Spreadsheet”.

#### Step 4. Determine total CPA emission reduction.

Total emission reduction from the CPA is determined by multiplying the average emission reduction per project participating households monitored, with the total number of project participating households registered at the time of verification.

See “Appendix 1 - spreadsheet”, for further details about calculated values.

Table H.2 - Summary of calculation of ER from CPAs in which project activities is implemented

CPA	Country	Average ER per households	Households	Emission Reduction	ER Claimed (Rounded)	
7358 - 0035	Malawi	43.31	-			
7359 - 0038	Nigeria		-	-	-	tCO <sub>2</sub> e
7359 - 0039	Nigeria		-	-	-	tCO <sub>2</sub> e
7359 - 0049	Malawi		22,323	966,797.41	966,797	tCO <sub>2</sub> e
7359 - 0052	Nigeria		53,841	2,331,825.45	2,331,825	tCO <sub>2</sub> e
<b>Total ER in tCO<sub>2</sub>e</b>				-	<b>3,298,622</b>	tCO <sub>2</sub> e
<b>Total number of households</b>			<b>76,164</b>			

**H.2. Calculation of project emissions or actual net GHG removals by sinks**

&gt;&gt;

There is no project emissions.

Actual net GHG removal by sink is the same as the baseline net GHG removal by sink as described in section H.1 above.

**H.3. Calculation of leakage**

&gt;&gt;

Potential leakage is accounted for by multiplying with net gross adjustment factor which is one of the alternatives in the registered PoA-DD.

**H.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks**

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (tCO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
7359-0035	0	0	0	0	0	0
7359-0038	0	0	0	0	0	0
7359-0039	0	0	0	0	0	0
7359-0049	966,797	0	0	0	966,797	966,797
7359-0052	2,331,825	0	0	0	2,331,825	2,331,825
<b>Total</b>	<b>3,298,622</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,298,622</b>	<b>3,298,622</b>

**H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)**

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
7359-0035	63,553	0 tCO <sub>2</sub> e
7359-0038	48,839	0 tCO <sub>2</sub> e
7359-0039	43,784	0 tCO <sub>2</sub> e
7359-0049	134,215	966,797 tCO <sub>2</sub> e
7359-0052	128,009	2,331,825 tCO <sub>2</sub> e
<b>Total</b>	<b>418,398</b>	<b>3,298,622 tCO<sub>2</sub>e</b>

Ex-ante emission is calculated by taking the ex-ante emission for 2015 as registered in the CPA DDs and divided by two (ER is claimed for half of 2014), plus the expected ER in 2015 plus half the ER in 2016. See tab Expected ER in the spreadsheet for Emission Reductions calculations.

**H.6. Remarks on difference from the estimated value in the included CPA-DD(s)**

&gt;&gt;

The emission reduction is larger than expected for CPA 7359-0049 and CPA 7359-0052. There are several reason for this including;

- All the households in Malawi has been registered in CPA 7359-0049, which include the whole country, rather than registering some of the households in CPA 7359-0035 which only cover part of the country.
- All the households in Nigeria has been registered in CPA 7359-0052, which include the whole country, rather than registering some of the households in CPA 7359-0038 and CPA 7359-0039 which only cover part of the country.
- The project has been able to expand faster than expected when the CPA DD was prepared, and as a result more households have been included in the program than was initially expected. CPA 7359-0049 and CPA 7359-0052 had been expected to include only 12,000 households each, but the actual number of households included in the program in these two CPAs are 22,323 and 53,841 respectively.
- The community based water supply solutions are provided to the poorest communities, and these communities have more people in each household than average households. The average number of people in each households is larger, and therefore the water consumption by each project participating households is therefore larger than what was assumed when the CPA DDs was prepared.
- The ex-ante emission reductions in the CPA DDs was very conservative. This was done deliberately as the projects was greenfield projects and it was known that many projects over estimate their expected emission reductions. To avoid the risk of over estimating the expected ER, very conservative values was used in the expected emission reductions in the CPA DDs.
- Due to the challenging market for carbon credits, Green Development has focused all its resources to expand in a limited number of CPAs, rather than expanding in all the CPAs that has been registered in the CDM PoA. As a result, more than 80% of all the households have been included in CPA 7359-0049 and CPA 7350-0052 rather than spreading our resources out to all the CPAs in the program. See <http://greendevlopment.no/participants>. As a result, ER is much larger than expected in CPA 7359-0049 and CPA 7350-0052 but the overall ER for the whole PoA DD is much less than expected<sup>7</sup>.

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<sup>7</sup> The number of households in the whole PoA increases constantly. The total number of households included in the program by <sup>th</sup> of February 2016 was 83,088 households, which equals to 9.1% more than what has been registered with the two CPAs referred to. Hence more than 90% of all the households included in the PoA has been included in the 2 CPAs in which ER is claimed from this MR. Total expected ER from the PoA was in excess of 7 million ton CO<sub>2</sub> during the monitoring period. Since the end of the monitoring period until the completion of this MR more than 20 CPAs have however been removed from the program, and this affect the expected ER from the PoA, but does not affect the expected ER from the CPAs included in this MR.

## Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities

<b>Coordinating/managing entity and/or responsible person/entity</b>	<input checked="" type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Green Development AS
<b>Street/P.O. Box</b>	Wergelandsveien
<b>Building</b>	Nr. 27
<b>City</b>	Oslo
<b>State/Region</b>	Oslo
<b>Postcode</b>	0167
<b>Country</b>	Norway
<b>Telephone</b>	+47 93630700 or +27 794825547
<b>Fax</b>	
<b>E-mail</b>	<a href="mailto:hn@greenvelopment.no">hn@greenvelopment.no</a>
<b>Website</b>	<a href="http://www.greendevlopment.no">www.greendevlopment.no</a>
<b>Contact person</b>	Havard Norstebo
<b>Title</b>	General Manager
<b>Salutation</b>	Mr.
<b>Last name</b>	Norstebo
<b>Middle name</b>	-
<b>First name</b>	Havard
<b>Department</b>	-
<b>Mobile</b>	+47 93630730
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### Document information

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i The post registration changes is listed under section "A.2 Purpose and general description of the PoA" in the PoA-DD version 13.