CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-SSC-PoA-DD) Version 01

CONTENTS

Annexes

NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

(ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).

List of Abbreviations:

CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH_4	Methane
CME	Coordinating/ Managing Entity
CO	Carbon monoxide
CO_2	Carbon dioxide
CPA	CDM Programme activities
CPA-DD	CDM Programme activities Design Document
DARE	Developmental Association for Renewable Energies
DNA	Designated National Authority
DOE	Designated Operational Entity
DRB	Demonstrably Renewable Biomass
EB	Executive board
EC	Eligibility Criteria
FAO	Food and Agriculture Organization
GDP	Gross domestic product
Gg	Giga gram
GHG	Greenhouse gas
GS	Gold Standard
GWh	Giga watt hours
ICS	Improved Cooking Stove
kW	Kilowatt
LDC	Least developed country
LHL	Lernen-Helfen-Leben e.V.
NCV	Net calorific value
NFCCN	National Forest Conservation Council of Nigeria
NRB	Non renewable biomass
N_2O	Nitrous oxide
ODA	Official Development Assistance
PoA	Programme of Activities
SID	Small Island Developing Country
SME	Small/Medium Enterprises
SSC	Small-Scale Program
SSCU	Special Climate Change Unit
TJ	Tera joule
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
WBT	Water boiling test

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

>>
Improved Cooking Stoves for Nigeria Programme of Activities

Version: 2.3
Date of completion: 24/10/2011
Completed by: atmosfair gGmbH

The programme will be developed as a CDM Gold Standard Programme of Activities

A.2. Description of the small-scale programme of activities (PoA):

>>
The Improved Cooking Stoves (ICS) for Nigeria Programme of Activities is a joint initiative by the German NGOs atmosfair gGmbH [1] and Lernen-Helfen-Leben e.V. (LHL) and the Nigerian Developmental Association for Renewable Energies (DARE) to promote dissemination of improved cooking stoves to households in the Federal Republic of Nigeria. The efficient stoves disseminated save up to 80% of fuel wood.

Contribution to sustainable development

Besides saving greenhouse gases, the programme aims to

- bring wood consumption down so as to allow natural recovery of forests and/or reforestation to take place,
- diminish Indoor Air Pollution from wood smoke and avoid its harmful health consequences,
- diminish the fuel wood bill for households,
- preserve wood resources so as to avoid inter-communal and/or inter-religious conflict over resources.

The general setup of the programme is as follows:

1. General operating and implementing framework of PoA

Fuel Wood Use as main driver for deforestation and greenhouse gas emissions

Land Use and Land Use Change is the main source of Greenhouse Gas Emissions in Nigeria, and, according to Nigeria's First national Communication under the United Nations Framework Convention

[1] Please note that "atmosfair", "Atmosfair", "atmosfair gGmbH" all refer to the same entity. See Annex 1 for contact details.

on Climate Change, contributed to 40 % of CO_2 emissions of the country (in 1994).[2] Since then, emissions from land use change and forestry have continuously increased: In 1990 CO_2 emissions from changes in forest and other woody biomass stocks was estimated as 52,241 Gg CO_2, increasing to 94,781 Gg CO_2 in 2000 (Source: Obioh, Imoh (2003): Trends in Greenhouse Gas Emissions in Nigeria: 1988-2000, p.92-94.).

Fuel Wood Consumption is one of the main drivers of land use change and deforestation in Nigeria. Traditional cooking stoves do not use energy efficiently and require large quantities of non-renewable fuel wood, hence leading to greenhouse gas emissions.

Fuel-wood is transported over long distances from the high forest zones of the South of Nigeria to the Middle Belt and Northern parts of Nigeria, where the forest has almost been entirely cleared.

Fuel Wood Transport by donkeys; Northern Nigeria.

Fuel Wood Sales by commercial traders along the road to Kaduna, Kaduna State

Train offloading in Kaduna, carrying fuel wood originating from the High Forest Zone

Truck in Kaduna, transporting diesel and fuel wood

[2] Ministry of Environment of the Federal Republic of Nigeria (2003): NIGERIA'S FIRST NATIONAL COMMUNICATION UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, p.4, http://unfccc.int/resource/docs/natc/nignc1.pdf, last accessed 11.02.2010

The National Forest Conservation Council of Nigeria (NFCCN) estimates that forests in Nigeria will be cleared entirely until 2020 if current rates of deforestation are not reduced. The lack of reforestation activity means clearing is not being offset by new plantings. With forests almost gone in the north of the country already, the loss of tree cover is also thought to be helping accelerate the spread of deserts and reduce farming land. A report by the NFCCN in 2008 estimated that 35 % of arable land had been lost to desertification in the north over the last 50 years[3].

Improved cook stoves have not yet gained significant foothold in the country

Improving the efficiency of fuel wood consuming appliances is therefore crucial to combat deforestation and tackle greenhouse gas emissions in Nigeria, but a large-scale adoption of improved appliances has not yet taken place. The Draft Renewable Energy Master Plan for Nigeria states: *"Enhancing economic efficiency of energy use is vital to achieve the best utilization of biomass resources and to protect the environment, and should be given a high priority[4]."* However, the plan also states that despite Research & Development efforts, "*improved wood stoves have not gained any significant foothold in any part of the country*[5]."
There have been several pilot projects to disseminate improved cooking stoves to household users in Nigeria, but these projects have not led to a broader diffusion of improved cooking stoves. Other renewable alternatives to the use of Non-renewable biomass or fossil fuels for cooking (e.g. plant oil, gas of biogenic origin, solar cookers) have not gained any significant importance in Nigeria. The existing CDM pilot programme (CDM Project Ref 2711) which was developed by atmosfair has started to disseminate efficient cooking stoves in the Guinea Savannah Zone, but due to the limited scale of the project, it will not suffice to tackle the problem of deforestation and hence greenhouse gas release.

Rationale to design the PoA

From the explanations above, it is evident that adoption of improved cooking stoves on a much larger scale is urgently needed. For this reason, atmosfair/LHL and DARE designed the present PoA.
DARE (Developmental Association for Renewable Energies), together with other local organisations and companies, the German NGO LHL (Lernen-Helfen-Leben e.V.) and the German non-profit company atmosfair as managing entity will foster the dissemination of highly efficient cook stoves.

Organisational structure of the PoA

Managing entity
Though the programme is a joint initiative by atmosfair, LHL and DARE, for legal matters, atmosfair shall serve as managing entity and sole legal representative of the programme. Therefore, atmosfair shall be the coordinating entity and sole focal point which communicates with the Board, including on matters

[3] "Nigerian's Forest could go by 2020", Carbon Positive News Article, provided to DOE.

[4] REMP (2005): Renewable Energy Master Plan, Final Draft Report, Energy Commission of Nigeria, UNDP, p.92, http://www.iceednigeria.org/workspace/uploads/nov.-2005.pdf, last accessed 11.10.2011

[5] REMP (2005): Renewable Energy Master Plan, Final Draft Report, Energy Commission of Nigeria, UNDP, p.15, http://www.iceednigeria.org/workspace/uploads/nov.-2005.pdf, last accessed 11.10.2011

relating to the distribution of CERs. atmosfair will ensure that all CPAs under its PoA are neither registered as an individual CDM project activity nor included in another registered PoA and that the CPA is subscribed to the PoA. atmosfair will manage a central database for all CPAs.

Other tasks of the managing entity may include:

- Partnering with and contracting of ICS suppliers and distributors
- Stove procurement, i.e. order and shipment (if applicable) to the distributors
- Development of numbering procedures to avoid double counting, also with regard to other PoAs or CDM projects in Nigeria
- Assignment of DOEs for validation, CPA inclusion and verifications

Role of DARE and LHL
Developmental Association for Renewable Energies (DARE) is a Nigerian non-profit organisation aiming at promoting the sustainable management of natural resources in Nigeria.
DARE will have the role of representing the PoA in Nigeria. DARE will also be a distributor of Improved Cookstoves. However, in this PoA, DARE will not be a project participant, and the role of DARE as representing the PoA is not an official function in relation to any PoA rules or PoA definitions of entities. The same applies for Lernen-Helfen-Leben e.V. (LHL), a German non-profit organisation founded in 1988 by former development workers to support private development projects in the field of education and environment. LHL will support atmosfair in managing the PoA and is the liaising organisation between atmosfair and DARE as well as other potential distributors.

Distributors
Tasks of registered distributors may include:

- stove assembly, if applicable
- Training of stove assemblers, if applicable
- Numbering of stoves, if applicable
- Stove promotion, incl. trainings and demonstrations
- Stove sales
- Customer support
- Monitoring data collection (e.g. contact details from stove users as required for the monitoring), processing and storage

Organisational chart showing the stakeholders involved in the PoA:

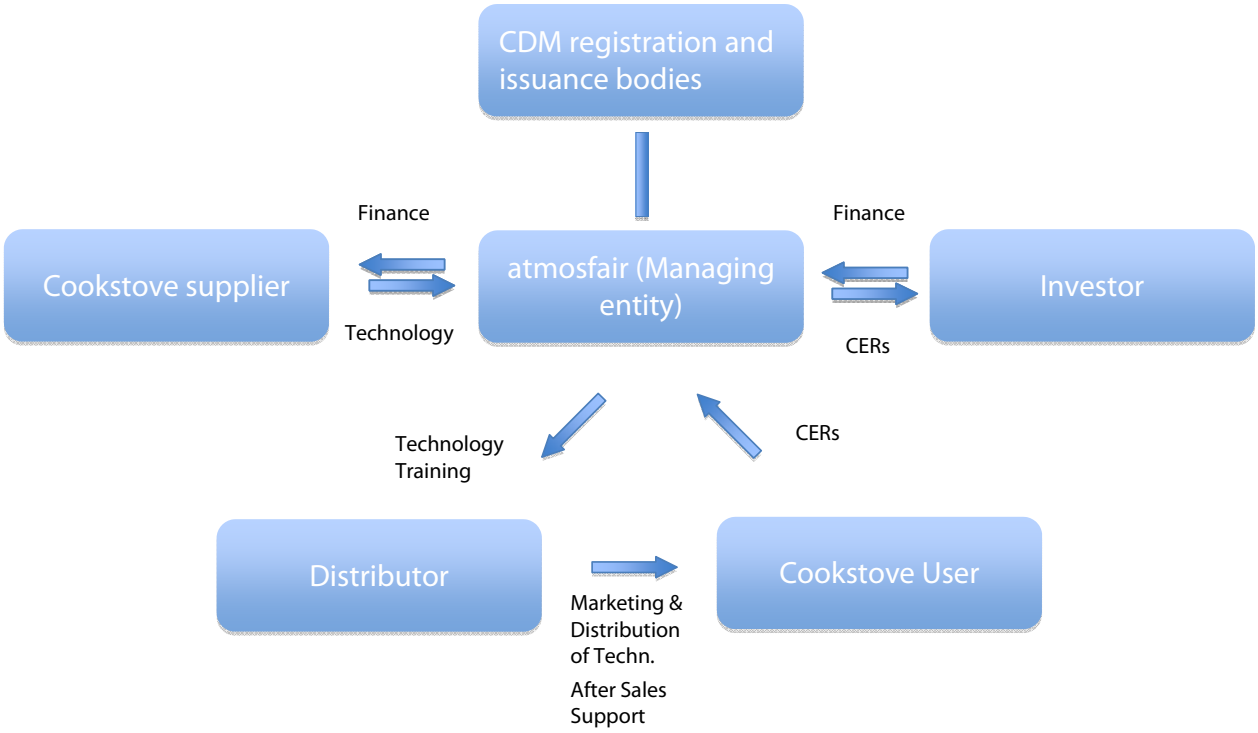

Figure 1: Relation between stakeholders in the PoA

2. Policy/measure or stated goal of the PoA

The aim of the PoA is to enhance the penetration of efficient cookstoves by offering cost-effective efficient stoves. The carbon revenues are utilised to recover the balance of costs.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

atmosfair as the coordinating/managing entity hereby confirms that the PoA is a voluntary action. Participation of all involved stakeholders such as distributors in the program is completely voluntary. There are no laws or regulations stipulating the use of efficient cook stoves. Existing laws and regulations concerning the protection of forestry areas in Nigeria are not enforced.

4. Prior Consideration

The plan to develop a CDM Programme of Activities for efficient cook stove dates back to 2008, when the methodology AMS II.G. became approved. However, due to regulatory uncertainties, atmosfair, LHL and DARE started to develop a CDM project under the conventional SSC CDM track, which was registered on October 12, 2009. After revision of AMS II.G. in December 2009 and ease of PoA rules, the three parties ultimately decided to pursue the development of the PoA to scale-up the dissemination of efficient cookstoves, and notified both the Nigerian DNA (Special Climate Change Unit – SSCU - of the Ministry of Environment) and the UNFCCC Secretariat. A Prior Consideration Form was submitted to

both entities on February, 17, 2010. The Project Idea Note was electronically submitted to the SSCU to apply for a letter of endorsement in February 2010. Letter of Endorsement was issued on July, 26, 2010.

5. Estimation of annual average emission reductions of the first CPA

The annual average emission reductions of the first CPA over the crediting period are 8,912 t CO2 per year. Please refer to the CPA-DD of CPA # 1 for explanation of this ex-ante estimate.

A.3. Coordinating/managing entity and participants of SSC-POA:

1. Coordinating or managing entity of the PoA as the entity which communicates with the Board

atmosfair is the coordinating/managing entity of the PoA who shall communicate with the Executive Board. Contact details are listed in Annex 1.

Name of Party involved	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Federal Republic of Nigeria (host party)	atmosfair gGmbH (coordinating/managing entity)	No

2. Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.

atmosfair gGmbH is a German not-for-profit company providing voluntary offsets for greenhouse gas emissions from air travel by CDM Gold Standard projects. atmosfair is also a CDM Gold Standard project developer. For contact details, see Annex 1.

A.4. Technical description of the small-scale programme of activities:

>>

A.4.1. Location of the programme of activities:

The Federal Republic of Nigeria

A.4.1.1. Host Party(ies):

The Federal Republic of Nigeria

A.4.1.2. Physical/ Geographical boundary:

The geographical area within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented is the Federal Republic of Nigeria. All CPAs will be implemented considering all applicable national/sectoral policies and regulations of Nigeria.

Figure 2: The physical boundary of the PoA- the Federal Republic of Nigeria.
Source: http://upload.wikimedia.org/wikipedia/commons/d/d2/Nigeria_political.png, last accessed 15.02.2010

A.4.2. Description of a typical small-scale CDM programme activity (CPA):

>>

Small-scale CPAs under the PoA will be implemented by the managing entity or CPA operators as defined in the CPA-DDs. Distributors, which are in contractual relations with the managing entity, and which gained access to technology and/or finance through the programme, will sell, install and maintain improved cook stoves in Nigerian households.

The geographical boundary of the CPA shall be Federal Republic of Nigeria. The CPA is further limited by the SSC threshold of AMS II.G., ver. 3, i.e. the maximum energy savings of the sum of all ICSs implemented under a specific CPA shall not exceed thermal energy savings of 180 GWh/ year (threshold as per clarification request SSC_233, available under: http://cdm.unfccc.int/methodologies/DB/6U8JYO9XTLVZ8LJ7GUBSZP145BIDG2). Once the

maximum number of appliances under the threshold is reached (or before, as deemed appropriate) (see Section E.2), the CPA shall be closed.
During the life of the SSC-PoA, the number of CPAs implemented will increase and be monitored according to the monitoring plan as described below.
Different CPAs will be installed in the same areas, but can always be distinguished by a sales record keeping system with a unique serial number for every ICS sold, which will ensure that each ICS can be traced to one specific CPA to avoid double counting.

Marketing and sales strategy

One possible marketing and sales strategy is awareness creation and cooking demonstration, which may be conducted frequently in different areas by distributors, where user households are informed about the benefits of the improved cooking stoves, especially about the savings in firewood consumption.
Local focal points (religious communities, associations, unions etc.) may facilitate the sales procedure.
Other distribution channels such as retailing networks or from networks from financial institutions may also be used.

User Agreements

When a user purchases an improved cooking stove, it will be property of the user. However, as CDM funding is subsidising the dissemination of the ICS, it will be ensured that users confirm on the sales receipt

- to cede all CERs to the managing entity
- to cooperate with the distributor and the managing entity for monitoring purposes
- that firewood and/ or charcoal was used prior to receipt of the ICS

A sales receipt will be handed over to the buyer, and a copy remains with the distributor.

Payment schemes

The distributors may offer payments in instalments to overcome the financial constraints of many customers. For example, if monthly instalments are agreed upon, payments can be collected either directly or by focal points (e.g. church communities) or deducted from the monthly salaries (in case of associations, unions etc.).

Monitoring

Information obtained from the users (i.e. sales receipts) are transferred to an electronic project database. Hardcopies will be stored.

A.4.2.1. Technology or measures to be employed by the SSC-CPA:

>>

Technology

SSC-CPAs will deploy improved cook stoves (ICS) reaching a specified efficiency of at least 20%, as also requested by AMS II.G., ver. 3.
The efficiency of the ICS shall be obtained from either the manufacturer specification or as certified by a national standards body or a certifying agent recognised by it.

Each CPA shall only disseminate one specific cook stove technology. The technical description and technical details shall be described in the respective SSC-CPA-DD.
For example, one improved cook stove disseminated under the PoA will be the "SAVE80", a portable stove made of stainless steel, developed and prefabricated by a German manufacturer and assembled locally to create employment and income. The initial model has a specified thermal efficiency of 52% and nominal effective thermal power of about 1.5 kW. As per specification of the manufacturer, the SAVE80 needs only about 250 g of small brittle sticks of wood to bring 6 litres of water to the boil, 80% less than traditional fire places. The design ensures preheating of the air and a complete combustion with no visible smoke and only small amounts of ash.
Design of the SAVE80 may develop over time.
The SAVE80 system also consists of custom-fit pots, pans and a heat retaining box ('Wonderbox'), where food can be transferred after reaching the boiling temperature, and where it will continue to simmer until it is well cooked. The Wonderbox allows important energy savings in addition to the savings by the Save80. However, these energy savings will not be taken into account for calculating emission reductions which is increasing the overall conservativeness of the Emission Reduction calculations.

Safe and environmentally sound operation
Since the project activity does not imply the construction of a plant, there are no negative environmental impacts. To ensure safe operations, users will receive instruction manuals and may also receive trainings.

A.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:

>>

The following criteria need to be fulfilled by each CPA to be included in the PoA:

Nr	Eligibility Criteria		Mean of proof / Evidence Document (to be checked at CPA inclusion)
	Category	Description	
1	Technological requirements	The CPA consists of distribution of domestic ICS, stove type (single pot or multi pot portable or in-situ cook stove) defined in the CPA-DD, and hence appliances involving the efficiency improvements in the thermal applications of non-renewable biomass as per AMS II. G, ver. 3 Please note that not all ICS may have been deployed at CPA inclusion stage, the 'type and number of ICS deployed' will however also be checked during verification, and in case any deployed ICS type will be found not in line with the methodology requirement, those ICS will not be counted for emission reduction calculation.	Specification of ICS type and compliance with the technological requirements of AMS II G will be described in the specific CPA-DD. Document: Product data sheets or specification or product information sheets from manufacturer

2	Efficiency of the ICS	The ICS disseminated under the CPA has a specified efficiency of at least 20%	Document: Efficiency specification from manufacturer or certificate from a national standards body or a certifying agent recognised by it.
3	Boundary and location of the CPA	The CPA is located within Nigeria. Please note that not all ICS may have been deployed at CPA inclusion stage, the location of the ICS can however also be checked during verification, and in case any deployed ICS type will be found not in line with the boundary/ location requirement, those ICS will not be counted for emission reduction calculation.	Location and boundary is specified in the specific CPA-DD stating that the location is limited to Nigeria. Document: Statement of CME that the location and boundary is within Nigeria.
4	No Double counting of ICS	An unique numbering or identification system for the stoves disseminated is applied	The specific numbering or identification regime is included in the specific CPA-DD Document: First stove sales receipt (first CPA of PoA)
5	CER ownership	End users receiving ICS under the specific CPA contractually cede their rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC to the CME of the PoA	The default ICS sales receipt provided for end users is including the provision that emission reductions generated by the stove are owned by the CME Documents: 1. Default ICS sales receipt 2. First stove sales receipt (first CPA of PoA)
6	Technical requirement	Only new ICS will be disseminated	Specification of stove type and compliance with the technological requirements of AMS II G will be described in the specific CPA-DD. Document: 1. Statement from CME that only new stoves will be disseminated under the CPA 2. First stove sales receipt (first CPA of PoA)
7	De-bundling	The CPA is exempted from performing the de-bundling check since each individual sub-system, i.e. ICS, has thermal energy savings of less than 1% of the SSC threshold and will remain within this threshold throughout the crediting period. Please note that not all ICS may have been deployed at CPA inclusion stage,	Calculation is provided in the PoA DD (equations 1 to 4 in Section A.4.4.1 that show that according to thermal energy savings calculation provided in the AMS II G. in order to exceed the 1% threshold the number of eaters even under a 100% efficient ICS would be 693. Document:

		but the 1% threshold however can also be checked during verification, and in case any deployed ICS type will be found not in line with the De-bundling requirement, those ICS will not be counted for emission reduction calculation.	Manufacturer specification, demonstrating that the number of eaters is less than 693. Please note: The manufacturer specification value will be used for parameter HH_Cap, which is the max. value to be applied for calculation of emission reductions.
8	No Double-counting of CPA	The CPA is exclusively bound to the PoA. Confirmation that the programme activity has not been and will not be registered either as a single CDM project activity or as a CPA under another PoA.	A statement is included in the CPA-DD that the specific CPA will not be part of another single CDM project activity or CPA under another PoA Evidence: Check on UNFCCC website with date of access.
9	Awareness and agreement of those operating a CPA on PoA subscription	Contractual provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA	Declaration from CPA operators, stating that they are aware and have agreed that their activity is being subscribed to the PoA
10	Non-diversion of ODA in case of Public funding	The CME and the CPA operator (in case of being different from the CME) shall confirm that in case of public funding there shall not be diversion of Official Development Assistance.	Statement of CME and the CPA operator (in case of being different from the CME)
11	CPA start date	CPA start date shall not be before PoA webhosting date, i.e. 20/11/2010. Please note that not all ICS may have been deployed at CPA inclusion stage, the ICS start date can however also be checked during verification, and in case any deployed ICS will be found not in line with CPA start date requirement, those ICS will not be counted for emission reduction calculation.	Starting date as stated in the CPA-DD is after 20/11/2010. Document: 1. Statement from CME that no ICS under the CPA were sold before 20/11/2010. 2. First stove sales receipt (first CPA of PoA)
12	CPA crediting period	CPA starting date of the crediting period is date of inclusion into registered PoA or any date thereafter and crediting period not to exceed the PoA end date	A statement is included in the CPA-DD that the crediting period starting date is date of CPA inclusion into registered PoA or any date thereafter and crediting period not to exceed the PoA end date
13	Approval of CPA by CME	CME approved each CPA to be included into its registered PoA	Statement of CME giving approval for the CPA to be included into its registered PoA

14	Additionality of CPAs	Additionality is demonstrated by either approach 1 or approach 2 as described in the PoA DD: Applicability of additionality criteria for micro-scale projects (approach 1) OR Investment barriers described in the PoA-DD also apply for the CPA level (approach 2)	Approach 1: Calculation in the CPA-DD as demonstrated under Section E.2 of the PoA-DD, showing that CPA remains under 60 GWh thermal energy savings limit Document for demonstration that end users will be households: Product data sheet/ Product information sheets. OR Approach 2: Agreements with distributor(s) illustrating maximum sales prices for the stoves and documents real cost of the stove
15	SSC Limit for CPAs	The CPA will remain under the thermal threshold of 180 GWh/a thermal energy savings (threshold as per clarification request SSC_233) throughout the crediting period of the CPA. Please note that not all ICS may have been deployed at CPA inclusion stage, the SSC limit for CPAs can however also be checked during verification, and in case any deployed ICS will be found not in line with CPA SSC Limit for CPAs requirement, those ICS will not be counted for emission reduction calculation.	The estimated maximum number of ICSs is to be defined in the CPA-DD according to the equation provided in Section E.2

Table 1: Eligibility criteria (EC) for CPA inclusion

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

A SSC-CPA under this PoA will reduce anthropogenic CO_2 emissions below those that would have occurred in the absence of the registered PoA by deploying more efficient cookstoves which reduce woody biomass consumption from non-renewable sources.

The proposed PoA is a voluntary coordinated action

The PoA is a voluntary coordinated action taken by atmosfair. There is no mandatory programme in Nigeria to foster the dissemination of improved cooking stoves.

The proposed voluntary coordinated action would not be implemented in the absence of the PoA

The voluntary coordinated action would not be implemented in the absence of the PoA. The voluntary coordinated action is not financially viable in the absence of CDM. All external funding will stem from CDM, other external funding is not available. Therefore, the program would not have been implemented in the absence of CDM. There has not been a public announcement of the PoA going ahead without CDM. As CDM is the only external source of funding, the PoA and all CPAs can not go ahead without CDM funding. Required finance to fund the programme is only supplied in return for CERs or revenues from CER sales.

The additionality for the SSC-CPA is demonstrated by Approach 1 or Approach 2 applicable for the Project activity.

Approach 1: Demonstration of Additionality of Microscale Project Activities

According to the Guidelines for demonstrating additionality of microscale project activities, ver. 3, energy efficiency project activities that aim to achieve energy savings at a scale of no more than 20 gigawatt hours per year are additional if any one of the conditions below of the below conditions is satisfied:
(a) The geographic location of the project activity is in LDCs/SIDs or special underdeveloped zones of the host country identified by the Government before 28 May 2010;
(b) The project activity is an energy efficiency activity with both conditions (i) and (ii) satisfied (see below):

(i) Each of the independent subsystems/measures in the project activity achieves an estimated annual energy savings of equal to or smaller than 600 megawatt hours; and
(ii) End users of the subsystems or measures are households/communities/SMEs

The small-scale CPAs will fulfill condition (b) as:

- estimated annual energy savings of the independent subsystems (i.e. the ICS) are equal or below 600 megawatt hours, which corresponds to 1.8 GWh thermal energy savings per year. Hence, the requirement is the same as for the debundling check. According to the "Guidelines on assessment of debundling for SSC project activities, v03 (EB 54, Annex 13, par. 10) for determining the occurrence of debundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is no larger than 1% of the small scale threshold defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity. The small-scale threshold defined by the methodology applied, AMS II.G., is 180 GWh thermal energy savings per year (threshold as per clarification request SSC_233). Thus, 1% corresponds to 1.8 GWh thermal energy savings per year. Please refer to Section A.4.4.1 for the equations 1 to 4 demonstrating fulfillment of this requirement. Therefore, microscale additionality condition satisfaction compliance is demonstrated here and does not need to be repeated in the SSC-CPA.

- end users of the ICS are households/ communities/ SMEs. The PoA is for dissemination of domestic ICS only.

In order to qualify for the micro scale additionality demonstration, it will be demonstrated in the CPA-DD that the number of ICS disseminated under the CPA remain under the threshold of 20 GWh

(corresponding to 60 GWh thermal energy savings), according to the equation as under Section E.2, Limit of the small-scale CPA included in the PoA.

Approach 2: Additionality demonstration as per Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities.

According to Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities (EB 63, Annex 24),

"Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher."

Furthermore, according to the General Guidelines to the SSC CDM methodologies (EB 61, Annex 21) par 7. the following documents are considered for further guidance and guidelines:

(a) EB 35, Annex 34 , "Non-binding best practice examples to demonstrate additionality for SSC project activities"
(b) EB 50, Annex 13, "Guidelines for objective demonstration and assessment of barriers"

We are describing in the following section the investment barrier, which is the most relevant barrier for the proposed activity:

Investment Barriers

Investment Barriers are prevalent for the proposed activity. According to EB 35 Annex 34, investment barriers are there if *"a financially more viable alternative to the project activity would have led to higher emissions;"*
The alternative is the three stone fire, which does not cost anything because its three stones put together; As for ICS, users do not have the necessary means[6] to purchase high-quality improved cook stoves reaching a thermal efficiency of at least 20% if sold at a retail price which would include all costs (landed

[6] The average annual GDP per capita in Nigeria was 1,118 USD in 2009 (Source: http://data.worldbank.org/country/nigeria, last accessed 01.06.2011)

costs plus distributor's margin) [7]. Consequently, local distributors have to sell the ICS at subsidised price and hence do not have sufficient revenues from stove sales to finance their stove dissemination activities. As stoves are sold below the retail price which would be necessary to cover all costs, the necessary investment relies on a second revenue stream other than sales revenues which is carbon revenue.[8]
In the CPA-DDs, simple cost analysis will be applied as proposed as best practice in EB 35, Annex 34 in order to demonstrate that costs for manufacturing, transporting and assembly (if applicable) exceed the price that end users are able to pay. For this purpose, an Excel sheet template was created and provided to the DOE.

According to Guideline 6 of EB 50, Annex 13, " In case the PPs make the claim for investment barriers, they should demonstrate in the PDD that the financing of the project was assured only due to the benefit of the CDM."

As demonstrated above, neither the CME nor the distributors do have any incentive to invest in this programme without CDM as a second revenue stream in addition to the sales of stoves is required to cover costs.
There is no precedent for dissemination of ICS in Nigeria at this scale without carbon finance. Even in the whole West African region, similar activities in the region have only been implemented with grants or with CDM upfront funding. For example, refugee camps in Chad have been equipped with SAVE80 systems with financial support from UNHCR.[9] The CDM pilot project (Ref. 2711) is funded upfront by atmosfair.
It can therefore be demonstrated that the source for upfront finance and investment in the PoA is connected to future revenues from the sale of CERs.
It is important to note that even under CDM, financiers are reluctant to invest in activities in the household energy sector, especially in Sub-Saharan Africa, as risks of such an investment are perceived to be high. However, it is the objective of the programme to also attract financiers who would normally not finance this kind of activity by implementing CPAs step by step. By successful demonstration that CPAs will eventually issue CERs, banks, funds and compliance buyers who would normally perceive household energy projects in Sub-Saharan Africa as high risk investments may take over financing of the CPAs. Whether or not the stoves are funded upfront in return of CERs or funded by financing institutions enabling procurement of the stoves, CER returns will always be the revenue needed for the distributors to bridge the gap between sales price and costs.

A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

A.4.4.1. Operational and management plan:

[7] Landed costs means total cost of purchasing, transporting, warehousing and distributing the ICS. The calculation and supporting documentation was made available to the DOE for the Save80 ICS during validation. In case other ICS are included as CPAs, a similar calculation will be provided at CPA inclusion check level, if approach 2 is chosen.

[8] The cooperation agreement between the CME and the distributors will be provided to the DOE at CPA inclusion check level, if approach 2 is chosen

[9] As of June 2008, the manufacturer had delivered more than 40.000 SAVE80 systems to the refugee camps, financed by UNHCR and other donors. The first CDM project disseminating improved cook stoves in Nigeria was registered in October, 2009.

>>

(i) A record keeping system for each CPA under the PoA,

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

- Name and ID of the CPA
- Technology deployed (Name of the ICS type)
- Name and contact details of the registered distributors for the CPA, date of registration of the distributor
- Serial numbers (Stove-ID) of the ICS belonging to the CPA[10] and corresponding information required for monitoring (please refer to Section E.7.2 for details)
- Start of CPA crediting period

The record keeping system will be updated as per the progress of the CPA.

Each improved cooking stove will start to generate emission reductions in the month following the sales date (or the date of CPA inclusion, whichever is later), to account for delays between sales and first use.

Data will be kept for the whole crediting period of the CPA and an additional two years.

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,

Procedure to avoid double counting
In each CPA-DD it will be stated that the CPA has not been and will not be registered either as a single CDM project activity or as a CPA under another PoA.

The serial numbers allocated to each ICS under the PoA allow unique identification and tracking of the ICS. Based on the serial numbers, an ICS can only count in one CPA.

(iii) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

Procedure to check for debundling
According to the "Guidelines on assessment of debundling for SSC project activities, v03 (EB 54, Annex 13, par. 10) for determining the occurrence of debundling under a Programme of Activities (PoA)", if each of the independent subsystem/measures included in the CPA of a PoA is no larger than 1% of the small scale threshold defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity.

[10] The serial numbers for the ICS will be either from the manufacturer and manufacturer will confirm with each order that the serial numbers are unique; or, if the serial numbers are allocated by the CME, the ICS shall have a code for the PoA (PoA registration number; alternatively: atm), followed by a code for the ICS itself. Example: atm00001. Note: There may also be a separate code for the distributor or for other reasons, but since this is not required to uniquely identify the ICS it is not relevant here.

The small-scale threshold defined by the methodology applied, AMS II.G., is 180 GWh thermal energy savings per year (threshold as per clarification request SSC_233). Thus, 1% corresponds to 1.8 GWh thermal energy savings per year.

Calculation of thermal energy savings

Thermal energy savings per ICS are calculated by multiplying the annual biomass savings per subsystem (appliance) with its calorific value:

Equation 1

Energy Savings = $B_{y,savings}$ (per appliance) · $NCV_{biomass}$

= $B_{old,\ appliance} \cdot (1- \eta_{old} / \eta_{new}) \cdot NCV_{biomass}$

Parameter	Unit	Description
$B_{y,savings}$	t	Quantity of woody biomass that is saved in tonnes
$B_{old,\ appliance}$	t	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
η_{old}	%	Efficiency of the system being replaced (0.1 default value as per the AMS II.G., ver. 3)
η_{new}	%	Efficiency of the system being deployed as part of the project activity
$NCV_{biomass}$	TJ/t	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, which is 0.004166667 GWh/tonne)

As we need to remain below the small-scale threshold defined by the methodology, we transform equation above into

Equation 2

$$Energysavings > B_{old,appliance} \cdot (1 - \frac{\eta_{old}}{\eta_{new}}) \bullet NCV_{biomass}$$

The maximum permissible energy saving per appliance (subsystem) to remain exempted from performing the de-bundling check is 1.8 GWh/year.

Solving the equation above for $B_{old,appliance}$ and applying the default values for $NCV_{biomass}$ and η_{old} as provided in the methodology (ver. 3) and conservatively assuming a maximum value of 100% for η_{new} [11] it is demonstrated that in order to exceed the maximum energy savings per improved cook stove - the 1%

[11] The higher the efficiency of the appliance to be deployed, the higher the energy savings

SSC threshold – the quantity of woody biomass per appliance used in the absence of the project activity would be 480 t per year.

Equation 3

$$B_{old,appliance} < \frac{1.8 \frac{GWh}{year}}{(1-\frac{0.1}{1}) \bullet 0.004166667 \frac{GWh}{t}}$$

$$B_{old,appliance} < 480 \frac{t}{year}$$

The average baseline per capita consumption of fuelwood in Nigeria is 0.692 t per year (see Section E.6.1).
Dividing $B_{old, appliance}$ by the per capita consumption, we can show that an ICS with a 100% thermal efficiency would need a household size of more than 693 people to exceed the SSC threshold.

Equation 4

$$\frac{480 \frac{t}{year}}{0.692 \frac{t}{year}} = 693$$

The main point here is that the number of eaters will be much lower. Though households can be large in Nigeria, we are not aware of a household with 693 members. Furthermore, as per the eligibility criteria in Section A4.2.2, only domestic ICS are eligible, and there will be a cap per ICS for the maximum number of eaters (see Section E.6.3 and A.4.2.2), which will be below 693.
Therefore, it is herewith demonstrated at PoA level that each CPA of this PoA is exempted from performing de-bundling check. This will be confirmed at CPA inclusion check (see eligibility criterion 7, Section A.4.2.2) through the manufacturer specification, from which it can be seen that the ICS will be for less than 693 people.

(iv) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;

Awareness and agreement of those operating a CPA on PoA subscription
It will be ensured that all parties involved in implementing a CPA are aware and agree that the CPAs are subscribed to the PoA.

Trainings
CME will ensure that all involved parties in the CPAs (e.g. distributors, CPA operators if different from the CME) are trained adequately to meet the documentation requirements of the PoA. Regularly, physical

or virtual meetings will be carried out where the parties involved are exchanging their experiences and will receive updates from the CME which CME considers relevant to properly carry out the PoA.

A.4.4.2. Monitoring plan:

Sampling will be applied. As per EB 55, Annex 38, Footnote 2, "The Board will develop a guideline containing criteria for determining statistically sound verification techniques and methods. Project developers are requested to take note that programmes which may be registered as a single CDM project activity prior to the adoption of this guideline will be required to comply with such criteria at the point of verification." Since this PoA is going to adopt sampling methods to monitor several monitoring parameters, the provision given above will be taken into account.

All parameters as detailed in section E.7.1.will be monitored according to the procedures and monitoring framework established in E.7.2. The managing entity will store the data in an electronic database. Primary data will be stored by the distributors.

As per EB 55 Annex 38, par. 37, each request for issuance shall relate to all CPAs included in the PoA prior or during the specified monitoring period. Thus all CPAs will have to be monitored and verified in identical monitoring period.

A.4.5. Public funding of the programme of activities (PoA):

>>
There is no public funding from Annex I countries of the UNFCCC to implement the PoA. No ODA from Annex 1 countries will be diverted to the implementation of the PoA. See Section A 4.2.2 for further details how this will be checked at CPA inclusion.

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

>>
01/01/2012 or date of registration of the PoA whichever is later

B.2. Length of the programme of activities (PoA):

>>
28 years

SECTION C. Environmental Analysis

>>

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☑
2. Environmental Analysis is done at SSC-CPA level ☐

Environmental analysis is done at PoA level as the environmental impact does not depend on the specific geographical location where the ICS are used.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

No negative environmental impacts, including transboundary impacts, of the programme are neither expected by the project participants nor by the host country, and an environmental impact assessment is not required by host party regulations (see Section C3 below). In contrast, the programme will have positive environmental impacts, among improvement of Air Quality and Forest and Savannah protection.

Air quality

Indoor Air Pollution will be reduced. As the SAVE80, as well as the potential other ICS disseminated under the programme are almost smokeless, CO emissions are low and correspond to Kerosene. Other harmful substances like PICs (Products of Incomplete Combustion) are low as the combustion is nearly complete and only small quantities of ash need to be removed.

Forest and Savannah protection

Through the use of the ICS, less fuel wood will be consumed and hence the PoA directly contributes to lower the pressure on woody biomass, i.e. forests and shrubs. Indirectly, this also leads to a protection of water resources and a decrease in soil erosion through decreased deforestation. As a consequence of decreased deforestation, biodiversity will be improved.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

>>

It has been confirmed by the Designated National Authority for the Clean Development Mechanism in Nigeria, that according to the legislation in Nigeria, an Environmental Impact Assessment is not required for a typical CPA, included in this Programme of Activities.

The projects for which an Environmental Impact Assessment is mandatory are listed in the Environmental Impact Assessment Decree, No 86 of 1992, and can be accessed online:

http://www.nigeria-law.org/Environmental%20Impact%20Assessment%20Decree%20No.%2086%201992.htm

SECTION D. Stakeholders' comments

>>

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☑
2. Local stakeholder consultation is done at SSC-CPA level ☐

The CPA boundaries are not defined regionally within Nigeria, and may therefore cover the whole country. Therefore a PoA-level Stakeholder Consultation is deemed most appropriate.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

A stakeholder conference was held on Thursday, 30th September 2010 in the premises of DARE at No. 9, Ahmed Talib Avenue (Democrat Building), behind Crittal Hope, Kakuri, Kaduna-South.
Stakeholders were invited mainly by Email but also personally. The invited stakeholder represented a national cross section of stakeholder groups. Women groups and officials such as representatives from the Ministry of Women Affairs & Education were specifically invited as most end users of improved cookstoves are women who benefit from the advantages the stove programme brings.
The organizers also tried to have a balanced share of the two main religious groups (Muslims/ Christians). As a tradition during stakeholder conferences opening prayers were both from a Pastor and an Imam.

71 stakeholders 19 female, 52 male) attended the conference, a cross-section of federal, national and local stakeholders, among:

- Fuelwood traders
- Women Groups
- Religious representatives (both from Islam and Christian religion), Interfaith Mediation Center
- Government Representatives (Agriculture, Forestry, Environment)
- Environmental organisations
- Development Organisations and Youth Development Initiatives
- Journalists
- Research (Universities)
- Business and financial sector
- ICS Distributors under the PoA

The objective of the conference was to explain the PoA to relevant stakeholders in Nigeria and to gather their comments on the programme.

The full list and report was made available to the DOE.

D.3. Summary of the comments received:

>>
The general impression was very positive. Participants welcomed both the programme and the opportunity to exchange about it at the conference. Many participants pointed out that they found the meeting useful, educative and that they have benefited from the gathering.
The programme is seen by most participants as an important way of tackling environmental degradation and climate change. Specifically for the Save80 stove, participants appreciated the reduction of the price due to CDM GS; however, some remarked that the price is still high and further ways to subsidise the stoves should be explored. Participants also stressed that government agencies should get into the programme, too.
The summarised comments received can be seen from the Section D.4. below. Furthermore, participants were asked to score the impact of the programme against a set of sustainable development indicators (Air quality, Water quality and quantity, Soil condition, Other pollutants, Biodiversity, Quality of employment, Livelihood of the poor, Access to affordable and clean energy services, Human and institutional capacity, Quantitative employment and income generation, Balance of payments and investment, Technology transfer and technological self-reliance). 9 out of the 12 indicators were scored positive by the stakeholders, 3 were scored neutral. No indicator was scored negative.
The full report was made available to the DOE.

D.4. Report on how due account was taken of any comments received:

>>

The following table provides an overview on how comments were taken into account:

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Strengthen the cooperation with relevant government agencies	Yes	Contacts with some agencies have already been established and also new approaches to establish contacts will be developed in future.
Awareness Creation for the use of the Save80 stove	Yes	Training programmes for using the stove have already been developed, but will increase in the future. Especially for women.
Expand collaboration with religious groups, grass roots and other relevant institutions, especially focussing on the role/rights of women (e.g. Ministry of Women Affairs).	Yes	In order to achieve more awareness, there will be more collaboration with other organizations/institutions.
More training programmes and/or workshops for women on the use and the assemble of ICS.	Yes	Initiative to increase the participation of women in education/training programmes of the project.
Reduce the costs and increase the size of the stoves	Yes	Though the price for e.g. the SAVE80 stove will be substantially reduced, it is taken into account that the price is still too high for some people and that it's hard to afford it. Therefore there will be initiatives trying to reduce the price even more, but this is also subject to CDM market conditions and not easy to achieve.

SECTION E. Application of a baseline and monitoring methodology

This section demonstrates the application of the baseline and monitoring methodology to a typical SSC-CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a SSC-CPA in this PoA (PoA specific CDM-SSC-CPA-DD).

E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

>>

The approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA is AMS II G., ver. 3, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass", http://cdm.unfccc.int/methodologies/DB/6U8JYO9XTLVZ8LJ7GUBSZP145BIDG2
Sectoral Scope 3: Energy Demand

E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:

>>

Applicability of the methodology Part I: Limit of the SSC-CPAs included in the PoA

Each CPA will remain under the limit of small-scale project activity types (annual energy savings below 180 GWh, threshold as per clarification request SSC_233) during every year of the crediting period. The number of disseminated improved cookstoves is recorded in the database. Only the ICS recorded in the database will be part of each CDM programme activity.
The calculation of the maximal number of ICS to be disseminated per CPA in order to remain under the limit is according to the following inequation:

Equation 5

$$180\frac{GWh}{year} > B_{old,appliance} \cdot N_y \cdot (1-\frac{\eta_{old}}{\eta_{new}}) \bullet NCV_{biomass}$$

Parameter	Unit	Description
$B_{old,appliance}$	t	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
N_y	-	Adjusted total number of appliances deployed in period y
η_{old}	%	Efficiency of the baseline system/s being replaced (fraction) (0.1 default value)
η_{new}	%	Efficiency of the system being deployed as part of the project activity (fraction)
$NCV_{biomass}$	TJ/t	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, which is 0.004166667 GWh/tonne)

The equation above can be transformed into:

Equation 6

$$N_y < \frac{\frac{180\frac{GWh}{year}}{NCV_{biomass}}}{B_{old,appliance} \cdot (1-\frac{\eta_{old}}{\eta_{new}})}$$

Since N_y, $B_{old,appliance}$ and η_{new} are monitoring parameters whose values will be obtained during verification, an ex-ante estimated limit of ICS numbers will be defined at CPA inclusion stage in order to qualify for small scale threshold, according to the equation above. Since efficiency of the new stove when it is new is determined as per eligibility criterion this value will be used at CPA inclusion stage. This is conservative since the efficiency of the ICS as determined during monitoring will be equal or lower than

the efficiency as defined during inclusion stage. As for the required parameter $N_{eaters\ ,appliance}$ (to determine $B_{old,appliance}$), the household cap (see Section E.6.3) will be used. This is conservative since the number of eaters as determined during monitoring will always be equal or lower than the household cap.
Once the limit of ICS number as defined in the CPA-DD is reached (or before, as deemed appropriate), no additional ICS will be deployed under that CPA.

Applicability of the methodology Part II: Applicability criteria of AMS II.G. (Technology/measure)

1. AMS II.G., ver. 3 comprises "appliances involving the efficiency improvements in the thermal applications of non-renewable biomass. Examples of these technologies and measures include the introduction of high efficiency[12] biomass fired cook stoves[13] or ovens or dryers and/or improvement of energy efficiency of existing biomass fired cook stoves or ovens or dryers.

The improved cookstoves disseminated under the PoA and therefore under each SSC-CPA are high efficiency biomass fired cook stoves and hence the category is applicable.

2. Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods.

Non-renewable biomass has been used since 31 December 1989. Justification:

The "National Greenhouse Gas Inventory 1988-2000[14]" gives evidence that NRB has been used on a large scale since that date and even before. This evidence concerns:

- The decline of forestry areas in Nigeria due to land-use change, with an estimated loss of more than 54,000 km² of lowland rainforests (from 184,000 km² in 1989 to 130,000 km² in 2007). Equally, the Savannah area has dropped from 325,000 km² in 1989 to 230,000 km² in 2007, a loss of more than 100,000 km², and is expected to further decline in the coming years.

- The increase of emissions from the forest sector: The GHG-Inventory states that "the changes in forest and other wood biomass (F&WB) contributed the majority of emissions from land use change, followed progressively by forests and grasslands (F&G) Conversions." This means, that considerable surfaces ceased to be a sink and became an emitter. According to the report, Net emissions due to Changes in "Forest and other woody biomass" increased from 52,241.00 Gg CO_2 in 1988 to 94,781.00 Gg CO_2 in 2000.

Likewise, FAO data show a dramatic decline in forest areas and growing stock in forest land, as can be seen from the table below. In the last 20 years, Nigeria lost almost half of its forests. The deforestation rate rose from 2.68% per year between 1990 and 2000 to 4% per year between 2005 and 2010.

Forest areas and growing stock from forest in Nigeria

[12] The efficiency of the project systems as certified by a national standards body or an appropriate certifying agent recognized by it. Alternatively manufacturers' specifications may be used.

[13] Single pot or multi pot portable or in-situ cook stoves with specified efficiency of at least 20%.

14: Obioh, I. (2003): Trends in Greenhouse Gas Emissions in Nigeria: 1988-2000, p.92-94.

Year	1990	2000	2005	2010
Forest area (1 000 ha)	17,234	13,137	11,089	9,041
Growing stock in forest and plantation (mio m³)	2,061	1,611	1,386	1,161

Source: FAO (2010): Global Forest Resources Assessment 2010, Country Report Nigeria, p.26, http://www.fao.org/forestry/20262-1-1.pdf, last accessed on 12.10.2010

The anthropogenic factors which drive land use change are "primarily population pressure on land (i.e. mean population per unit area), intensity of agricultural activities, rate of forest logging and other wood products extraction activities, urbanization and other major developmental activities". [15] Consequently, land use change has led to a significant increase in CO_2 emissions since then.

E.3. Description of the sources and gases included in the SSC-CPA boundary

>>

As per the applied methodology AMS.II.G ver. 3, paragraph 3:"The project boundary is the physical, geographical site of the efficient systems using biomass." The geographical area within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented is the Federal Republic of Nigeria. The assessment of sources and gases included in the SSC-CPA boundary is given below.

	Source	Gas	Included?	Justification/ Explanation
Baseline	Combustion of non renewable biomass for cooking, Emission Factor for combustion of fossil fuels for cooking	CO2	Yes	Major source of emissions
		CH4	No	Not required by methodology, only CO2 Emission Factor for fossil fuels is considered.
		N2O	No	Not required by methodology, only CO2 Emission Factor for fossil fuels is considered.
Project activity	Combustion of non renewable biomass for cooking, Emission Factor for combustion of fossil fuels for cooking	CO2	Yes	Major source of emissions
		CH4	No	Not required by methodology, only CO2 Emission Factor for fossil fuels is considered.
		N2O	No	Not required by methodology, only CO2 Emission Factor for fossil fuels is considered.

Both in the baseline (usage of inefficient baseline appliance) as in the project activity (usage of ICS) the combustion of non renewable biomass leads to CO2 emissions. But because ICS are more efficient compared to the baseline appliances, less CO2 is emitted. The difference is accounted for as emission reductions, like for any energy efficiency project. As there could be occasions that the users of the ICS still keep using the baseline appliance, which might lead to more than 1% of the overall expected average annual emission reductions, the continuous use of the baseline appliance will be accounted for.

[15] Obioh, I. (2003): Trends in Greenhouse Gas Emissions in Nigeria: 1988-2000, p.87

By determining the average number of eaters per (new) appliance, the continuous use of the baseline appliance is considered as only the baseline consumption which is reduced by the project appliance is considered. If users are cooking with other (i.e old) appliances in occasions such as, for example, a big family gathering, this will not be considered, since the parameter $B_{old,\ appliance}$ is determined by multiplication of the per-capita consumption with the number of eaters for the new appliance only. (please refer to the parameter $N_{eaters\ ,appliance}$ in the monitoring tables in Section E.7.1.)

Note that the CO_2 Emission factor for the substitution of non-renewable woody biomass by similar consumers must be used to calculate emission reductions according to the methodology AMS II.G. ver. 3 provides a default value of 81.6 tCO2/TJ. This is a conservative assumption, as, compared to the emission factor for wood of 112 t CO_2/TJ (see 2006 IPCC Guidelines for National Greenhouse Gas Inventories, p. 2.23), only 73% of the *de facto* emission reductions when using the improved cookstoves are taken into account.

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

Following par.4 of ver. 3 of the methodology, it is assumed that in the absence of the PoA, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs. Therefore, emission reductions are calculated by multiplying the thermal energy from annual biomass savings stemming from non-renewable biomass with an emission factor for fossil fuels.
For determination of each parameter required for the emission reductions, please refer to Section E.6.2.

There are no specific national or sectoral policies prohibiting the use of the three stone fire. In former times, Kerosene usage was much more widespread throughout the country, but due to increasing prices, and unreliable supply, Nigeria is "descending the energy ladder" in the last years, going backwards from Kerosene usage to fuelwood use.[16]
The most plausible baseline scenario is hence that firewood, charcoal from non-renewable sources and – to a lower extent - fossil fuels are supplying thermal energy for the users.
However, any savings from reduced usage of fossil fuels will not be counted towards emission reductions since the ICS will replace traditional appliances that were using non-renewable biomass and savings from reduced Kerosene usage is a positive side effect but will not be further considered.
For additional information on forest policies, please also refer to Section E.6.1

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA): >>

E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:

>>
A typical SSC-CPA consists of several ICS. The installations fall under the authority of the coordinating/managing entity.

[16] Maconachie et al. (2009): Descending the energy ladder? Oil price shocks and domestic fuel choices in Kano, Nigeria. In: Land Use Policy 26, 1090-1099

As described in section A.4.3, ICS face barriers which are alleviated by CDM. The ICS would therefore not be installed in the absence of the CPA to which they belong. As a result, a typical CPA is additional. As described, CDM helps to overcome the barriers that the coordinating/managing and the CPA implementers are facing to roll out the ICS programme. This clearly stipulates that without the SSC-CDM-PoA, no ICS installations and therefore no CPAs would be implemented.

Consequently, a SSC-CPA can demonstrate the additionality using Approach 1 or Approach 2 given in the Section A.4.3 of the PoA-DD. Additionality of the small scale CDM Project can be demonstrated by showing that the Project would not occurred anyway as per Approach 1 or due to existence of investment barriers as per Approach 2. Description of the barrier at PoA level is provided in section A.4.3. The arguments presented therein are also prevalent in the SSC-CPA Project area. Hence, the SSC-CPA need not re-write the arguments presented therein to support CPA additionality, as, in accordance with EB55 Annex 38 para 6.g,[17] the assessment of additionality of each SSC-CPA to this PoA shall be evaluated on the basis that if the proposed SSC-CPA meet the key criteria and data stipulated in section E.5.2. below, the SSC-CPA shall be deemed additional.

E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:

>>

As demonstrated in the section E.5.1 the key criteria for assessing the Additionality of a SSC-CPA would be either Approach 1 or Approach 2 as mentioned below. It is assumed that all ICSs installations and hence all SSC-CPAs which are going to be included under the registered PoA are additional, provided they meet

- the additionality eligibility criteria for inclusion of a SSC-CPA in the PoA as set in section A.4.2.2.,
- that no public funding or ODA was or will be diverted (see eligibility criterion 10) and
- that the CPA is consistent with the mandatory laws and regulations in the Federal Republic of Nigeria.

Approach 1: Demonstrating additionality for microscale CPAs
The CPA to demonstrate compliance with the applicability conditions: This is shown by fulfillment of additionality eligibility criteria (criterion 14) as in Section A.4.2.2: Calculation in the CPA-DD as demonstrated under Section E.2 of the PoA-DD, showing that CPA remains under 60 GWh thermal energy savings limit

OR

Approach 2: Demonstrating additionality for Small scale CPAs
Investment barriers described in the PoA-DD also apply for the CPA level. The CPA to demonstrate compliance with the applicability conditions: This is shown by fulfillment of additionality eligibility criteria (criterion 14) as in Section A.4.2.2: Evidence presented to the DOE: Agreements with distributor(s) illustrating maximum sales prices for the stoves and documents real cost of the stove

[17] ("definition of eligibility criteria for inclusion of a project activity as a CPA und PoA, which shall include, as appropriate, criteria for demonstration of additionality of the CPA and the type […] of information […] that […] shall be provided by each CPA in order to ensure its eligibility)

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:

>>

According to AMS II. G., ver. 3, par. 5, emission reductions shall be calculated using the following equation:

Equation 7

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

Parameter	Unit	Description
ER_y	tCO_2	Emission reductions of the project activity in period *y*
$B_{y,savings}$	t	Quantity of woody biomass that is saved by the CPA in period y
$f_{NRB,y}$	%	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass
$NCV_{biomass}$	TJ/t	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	tCO_2/TJ	Emission factor for the substitution of non-renewable woody biomass by similar consumers Use a value of 81.6 tCO_2/TJ[18]

In the following, the steps to determine the parameters required to calculate emission reductions are described, including the methodological choices, where applicable. Please note that in order to derive the parameter B_{old} several sub-steps are required, and we need to define "own" parameters as the methodology is in this part only of descriptive nature.

Overview of steps to determine parameters required to calculate emission reductions:

Step	Description	Data sources	Derived Parameters
1	Quantity of woody biomass that is saved by the CPA in period y (according to option 2 of par. 6 AMS II.G., ver. 3)	-	$B_{y,savings}$

[18] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO_2/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO_2/TJ for Kerosene and 63.0 tCO_2/TJ for Liquefied Petroleum Gas (LPG).

1.1	Determination of quantity of woody biomass used in the absence of the project activity in tonnes	-	B_{old}
1.1.1	Determination of quantity of woody biomass used in the absence of the project activity in tonnes, per appliance	Historical Data (UN, Census Data) Monitoring Checks	$B_{old,\ capita}$ $N_{eaters\ ,appliance}$
1.1.2	Estimation of the number of appliances deployed per CPA and drop-out rate	CPA Implementation Schedule	N_y DO_y
1.1.3	Leakage related to the non-renewable woody biomass saved by the project activity	AMS II.G. Default Value	L_{nrb}
1.1.4	PoA Leakage related to Interference of NRB baseline with other CDM projects or CPAs	AMS II.G. Default Value	L_{PoA}
1.2	Determination of the efficiency of the replaced system	AMS II G Default Value	η_{old}
1.3	Determination of the efficiency of the deployed system	Efficiency Testing	η_{new}
2	Determination of the share of Non-Renewable biomass	Own assessment based on historical Data	$f_{NRB,y}$
3	Determination of the Net calorific value of the non-renewable woody biomass that is substituted	AMS II.G. Default Value	$NCV_{biomass}$
4	Determination of the emission factor for the fossil fuel most to be used by similar consumers	AMS II.G. Default Value	$EF_{projected\_fossilfuel}$

Table 2: Steps to determine parameters needed for calculation of emission reductions

Step 1: Quantity of woody biomass that is saved by the CPA in period y ($B_{y,savings}$)

Sub-Step 1.1: Determination of quantity of woody biomass used in the absence of the project activity in tonnes

AMS II.G., ver. 3, par. 6 provides three equivalent options (i.e. without any restrictions on applicability) to estimate $B_{y,savings}$. We choose to apply Option 2, where $B_{y,savings}$ is calculated according to the following equation:

Equation 8

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

Parameter	Unit	Description
$B_{y,savings}$	T	Quantity of woody biomass that is saved in tonnes
B_{old}	T	Quantity of woody biomass used in the absence of the project activity in tonnes

η_{old}	%	1. Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of system is being replaced; 2. A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used
η_{new}	%	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol. Use weighted average values if more than one type of system is being introduced by the project activity

Sub-Step 1.1.1: Determination of quantity of woody biomass used in the absence of the project activity in tonnes, per appliance

Also for B_{old} two equivalent options can be used to determine the quantity of woody biomass used in the absence of the project activity in tonnes. We choose to apply approach (a) of par. 7, AMS II.G., ver. 3:

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

Further assessment of the above paragraph shows that the average annual consumption of woody biomass in the baseline per appliance can be determined based on:

A) Historical Data, or
B) A Survey of Local Usage

As official, historical data on fuelwood consumption is available for Nigeria, we chose option a) "historical data" to establish the average annual consumption of woody biomass per appliance ($B_{old, appliance}$) ex ante.

To determine $B_{old, appliance}$ we are using the average fuelwood per capita consumption, multiplied by the average number of eaters per appliance.

The United Nations Statistics Division has published fuelwood consumption figures for households in Nigeria. To arrive at the per capita consumption, this figure is divided by the total population in Nigeria.

The most recent data available for fuelwood consumption is from 2008 (144,693,000 m³)[19]

[19] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW%3btrID%3a1231, last accessed on 19.08.2011

However, the most recent data available for the total population is only from 2006.

As we need to refer to the same baseline year, we can only use 2006 fuelwood consumption data (which is actually lower than the 2008 value, hence this approach is deemed conservative).

Therefore fuelwood consumption is = 134,006,000 m³ [20] (equal to 97,154,350 t[21]).

In 2006, according to official census figures, Nigeria had a population of 140,431,790[22].

The average fuelwood per capita consumption is hence 97,154,350 t / 140,431,790 = 0.692 t per year.

Wood Fuel Surveys from Nigeria and other African countries show a similar or higher consumption for fuelwood and charcoal, as shown in the table below.

Survey	Country	Region	Year	Rural (t/Head/a)	Urban (t/Head/a)	Total (t/Head/a)	Comments
Cline-Cole et al.	Nigeria	Kano	1987		0.498		only firewood (estimated household size: 8)
DESA	South Sahara Afica		1994			0.533	Firewood & Charcoal
E. L. Hyman	Nigeria	North	1994			0.53	
Anozie et al.	Nigeria		2004			0.8344	Wood equivalent of house-hold cooking energy demand
Brouwer/Falcao	Mozambique	Maputo	2003		0.65 – 0.725		Firewood & Charcoal
FAO-Wisdom	Burundi		2005	0.78 – 1.07	0.51		Firewood & Charcoal
FAO-Wisdom	DRC		2005	0.85	1.43		Firewood & Charcoal
FAO-Wisdom	Kenya		2005	0.57 – 0.75	0.60		Firewood & Charcoal
FAO-Wisdom	Rwanda		2005	0.36 – 0.73	1.35		Firewood & Charcoal
FAO-Wisdom	Sudan		2005	0.79	0.79		Firewood & Charcoal
FAO-Wisdom	Tanzania		2005	0.96	1.28		Firewood & Charcoal
FAO-Wisdom	Uganda		2005	0.62- 0.99	1.23		Firewood & Charcoal
Note: Used Conversion Factor Wood: 0.725 t/m³, NCV 15 MJ/kg							

Table 3: Comparison of wood fuel survey results.

It is important to note that the fuel wood consumption per capita is an average value for all Nigerian households, whether they are using fuel wood or not. This means that consumption among fuel wood users is even higher.
Nonetheless, as fuel wood is the main source of household energy, meeting more than 80% of the energy demand[23], we do not consider the de facto higher consumption among wood fuel users, which is the target group of the improved cook stoves disseminated. This is hence a conservative assumption.

[20] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW%3btrID%3a1231, last accessed on 19.08.2011

[21] Conversion factor for wood used: 0.725 t/m³. Source: FAO-WISDOM

[22] See 2006 Population and Housing Census of the Federal Republic of Nigeria, Document provided to DOE

In the next step, we need to estimate the average number of eaters per appliance to establish $B_{old, appliance}$. As this will depend on the ICS deployed (i.e. one can cook for how many people on an ICS, and how many people will still be served from baseline appliance), we can only establish an ex-ante estimation here, based on manufacturer specification, which is 8 eaters for the Save80 stove, one of the ICS that will be disseminated under the PoA. Whereas the average number of eaters used for calculation of emission reductions for verification will be monitored. This is a relatively low figure given the larger household sizes especially in the Northern parts of Nigeria and in lower income groups[24]

The Improved Cooking stoves will reduce the fuelwood consumption of households. Therefore, average baseline fuelwood consumption per appliance can be calculated as:

Equation 9

$$B_{old,appliance} = B_{old,capita} \cdot N_{eaters,appliance}$$

Parameter	Unit	Description
$B_{old,,appliance}$	t/year	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
$B_{old,capita}$	t/year	Average baseline fuelwood consumption per capita per year (fixed parametric value of 0.692 t/year, see Section E.6.1)
$N_{eaters,appliance}$	-	Average number of eaters per project appliance (monitored parametric value)

Applying the values from the sources described above, $B_{old,appliance}$ computes as:

Equation 10

[23] Obueh (2001): Using a household energy technology to promote small scale enterprises in rural communities in Nigeria – The egaga stove experience, in: Boiling Point 47/01:28

[24] The correlation between household size, type of fuel used and income level is described as "energy ladder", where households switch from "dirty" fuels such as animal dung and firewood to charcoal, kerosene and eventually LPG and electricity if the rising income allows it. The following quotes illustrate this correlation: "The users of firewood as main energy for cooking have the lowest per capita income compared to the users of charcoal and gas natural, not only because of their low average annual income but also because of the large size of these households." Cited from: Boukary Ouedraogo: Household energy preferences for cooking in urban Ouagadougou, Burkina Faso. In: Energy Policy 34 (2006) 3787–3795, p. 3795. "The inference is that households with more members are less likely to use LPG compared to fuelwood. It is quite evident, in general, that the household size is more in poorer households and can not afford modern fuels as incomes are low". Cited from: M. Narasimha Rao, B. Sudhakara Reddy: Variations in energy use by Indian households: An analysis of micro level data. In: Energy 32 (2007) 143–153; p. 149

$$B_{old,appliance} = 0.692 \frac{t}{year} \bullet 8$$

Equation 11

$$B_{old,appliance} = 5.53 \frac{t}{year}$$

As mentioned above, the number of eaters for which one ICS will be sufficient will vary depending on the ICS type disseminated. Hence, the average number of eaters per stove will be determined during monitoring for the relevant stove types. By doing so, we will thus also account for continuous use of baseline appliances (see Section E.7). The number of eaters per ICS type disseminated is therefore a monitored parameter which will be used to determine $B_{old,appliance}$ per CPA.

Sub-step 1.1.2: Estimation of the number of appliances deployed per CPA and drop-out rate

The next step to determine the parameter B_{old} is to estimate the number of appliances deployed per CPA and the drop-out rate, i.e. failure rate expected during the crediting period.

The actual calculation of emission reductions of each SSC-CPA will be based on the number of systems operating and their start of operation (N_y). The number will be adjusted according to the share of users found not to use the project appliance (Drop-Out Rate DO_y).

Conservatively, we will assume that the start of operations is the month following the sales date, to account for delays between sales and actual deployment.

As this parameters will be monitored, they are further explained in Section E.7.1., please refer to this section for details.

Sub-Step 1.1.3: Leakage related to the non-renewable woody biomass saved by the project activity and transfer of equipment

According to AMS II.G., ver. 3, par. 13 and par.14, the following potential sources of leakage have to be considered:

A) Use of NRB savings by non-project households

Leakage related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). The following potential source of leakage shall be considered:

(a) *The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass used by the non-project households/users, that is attributable to the project activity, then*

B_{old} is adjusted to account for the quantified leakage. Alternatively, B_{old} is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

Theoretically, it can happen that the non-renewable wood saved by the project is instead consumed by non-project households who previously did not have access to fuel wood and were covering their energy demand for cooking with renewable sources such as dung or crop residues.
Therefore, the default net to gross adjustment factor of 0.95 is applied to account for leakage and therefore surveys are not required.

Therefore, $L_{nrb} = 0.95$

B) Transfer of Equipment

"If equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered."

This leakage source can be ruled out since all stoves deployed under the program will be new stoves, which is also reflected in eligibility criterion 6.

Sub-Step 1.1.4: PoA Leakage related to Interference of NRB baseline with other CDM projects or CPAs

For the AMS II.G. to be used in a PoA, the following leakage sources have to be estimated, and accounted for, as per par. 23 of ver. 3:

"(a) Use of non-renewable woody biomass saved under the project activity to justify the baseline of other CDM project activities can also be potential source of leakage. If this leakage assessment quantifies a portion of non-renewable woody biomass saved under the project activity that is used as the baseline of other CDM project activity then B_{old} is adjusted to account for the quantified leakage.

(b) Increase in the use of non-renewable woody biomass outside the project boundary to create non-renewable woody biomass baselines can also be potential source of leakage. If this leakage assessment quantifies an increase in use of non-renewable woody biomass outside the project boundary then B_{old} is adjusted to account for the quantified leakage."

AMS II.G., ver. 3, par. 23 furthermore offers the option that

"(c) As an alternative to subparagraphs (a) and (b), B_{old} can be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required."

This option is used for the PoA, and hence, according to AMS II.G., ver.3, par. 23 c) the default net to gross adjustment factor of 0.95 is applied to account for PoA leakage and therefore par. 23 a) and b) do not apply.

Therefore, $L_{PoA} = 0.95$

Sub-Step 1.2: Determination of the efficiency of the replaced system

According to the chosen option 2 of par. 6 (see above), woody biomass savings are calculated by multiplying the average annual consumption of woody biomass per appliance per year, as derived from step 1.1, with the efficiency gains $\Delta\eta$ of the system being deployed as part of the project activity.

For the efficiency of the baseline systems being replaced (η_{old}), the default value provided in AMS II.G., ver. 3, shall be used. Justification:

AMS II.G. reads:
"0.10 default value may be optionally used if the replaced system is the three stone fire or a conventional system lacking improved combustion air supply mechanism and flue gas ventilation system i.e., without a grate as well as a chimney"

The three stone fire is the predominant "stove" type used in Nigeria. Other local stoves using wood fuel are available, e.g. the metallic tripod stove, but lack improved combustion air supply mechanism and flue gas ventilation system. The efficiency of the metallic tripod stove used in Nigeria – which is already an efficiency improvement as compared to the three-stone-fire - is mentioned in the "Renewable Energy Master Plan"[25] as below 10%.

Sub-Step 1.3: Determination of the efficiency of the deployed system

Efficiency of the systems being deployed (η_{new}) is determined using the "Water-Boiling-Test".
Note that η_{new} is a monitored parameter, and values derived from efficiency tests conducted ex-post shall be used to calculate emission reductions.

Efficiency gain $\Delta\eta$ of the appliances deployed under the programme is calculated as:

Equation 12

$$\Delta\eta = (1 - \frac{\eta_{old}}{\eta_{new}})$$

Parameter	Unit	Description
$\Delta\eta$	%	Efficiency gain of the system being deployed compared to the baseline system
η_{old}	%	Efficiency of the baseline system/s being replaced (fraction) (0.1 default value of AMS II.G.)
η_{new}	%	Efficiency of the system being deployed as part of the project activity (fraction)

The improved stoves of the PoA need to reach a thermal efficiency of at least 20%. However, improved stoves targeted under the programme may reach efficiencies of up to 50%, e.g. the SAVE80. T. Applying

[25] REMP, loc.cit., p.85

the benchmark value of 20% (as per the applicability criteria of AMS II.G., ver. 3, par. 1, footnote 2), minimum efficiency gain of the improved cookstoves (when being new) is:

Equation 13

$$\Delta\eta = (1 - \frac{0.1}{0.2}) = 0.5$$

Step 2: Determination of the Share of Non-Renewable Biomass

According to AMS II.G., ver. 3, par. 11, the following equation shall be used to calculate NRB:

Equation 14

$$f_{NRB,y} = \frac{NRB}{NRB + DRB}$$

Parameter	Unit	Description
$f_{NRB,y}$	-	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
NRB	t	Quantity of Non Renewable Biomass
DRB	t	Quantity of Demonstrably Renewable Biomass

A) Assessment of Non-renewable woody biomass in Nigeria

According to AMS II.G., ver. 3, Non-renewable woody biomass (NRB) is the quantity of woody biomass used in the absence of the project activity minus the DRB component, so long as at least two supporting indicators are shown to exist:

- Survey results, national or local statistics, studies, maps or other sources of information such as remote sensing data that show that carbon stocks are depleting in the project area

As shown in Section E.2, carbon stocks are depleting, greenhouse gas emissions from changes in forest and other woody biomass as well as from forests and grassland conversions are increasing.
Nigeria's First national Communication under the United Nations Framework Convention on Climate Change even reports that "Annual deforestation of the woodlands in northern Nigeria runs to about 92,000 hectares"[26]

[26] Ministry of Environment of the Federal Republic of Nigeria, loc.cit.

- Increasing trends in fuel wood price indicating scarcity

According to the Forest Resource Assessment Country Report for Nigeria (2010) fuel wood prices in Nigeria have increased by more than 2,000 % from 1990 to 2005, from 40 Naira per m³ over bark in 1990 to 850 Naira per m³ in 2005[27]. Though this development is largely due to the devaluation of the Naira, converted to US-$ it is still a 45 % increase during that period[28]. However, Naira values reported in the FRA 2010 are likely to be underestimated. The Baseline Survey conducted for the registered CDM project on efficient cook stoves found an average fuelwood price of almost 6 US-Cent per kg; leading to more than 265 US-$ of fuelwood expenses for an average household per year. Respondents of an enquiry[29] conducted by DARE in Kano in March 2010 reported an increase by 150% in the last twelve months alone. For instance, bundles that were sold for 50 Naira in the last year now cost 125 Naira; the major reason for the increase was that wood was hardly available.

B) Assessment of Demonstrably Renewable woody biomass in Nigeria

According to AMS II.G., ver. 3, Woody biomass is "renewable" if the woody biomass is originating from land areas that are forests or if the woody biomass is originating from non-forest areas (e.g., croplands, grasslands) and where conditions as specified in par. 9 are satisfied:

<table>
<tr><th>Condition</th><th>Assessment</th><th>Conclusion
☑ Condition satisfied
☒ Condition not satisfied</th></tr>
<tr><td>The land area remains a forest; or remains as non-forest or is reverted to forest, and</td><td>Nigeria has among the highest deforestation rates in Sub-Saharan Africa. At the end of the 19th century, the forest occupied up to 60% of the total land area of Nigeria. Today, deforestation is rapidly progressing and forest is converted into savannah and even desert. Other wooded land is declining as well.

Forest area and other wooded land in Nigeria

<table>
<tr><th>Year</th><th>1990</th><th>2000</th><th>2005</th><th>2010</th></tr>
<tr><td>Forest area (1 000 ha)</td><td>17,234</td><td>13,137</td><td>11,089</td><td>9,041</td></tr>
<tr><td>Other wooded land (1 000 ha)</td><td>9,717</td><td>6,902</td><td>5,495</td><td>4,088</td></tr>
</table>
</td><td>☒</td></tr>
</table>

[27] FAO (2010): Global Forest Resource Assessment 2010, Country Report Nigeria, http://www.fao.org/forestry/20262-1-1.pdf

[28] Ibid, p. 35: In 1990, a dollar exchanged for 9.00 naira but came to 109.55 naira in 2000. Note: In 2005, exchange rate was 132 Naira per dollar (source: fxtop.com, last accessed 29.04.2011)

[29] See Gold Standard Monitoring Report for UNFCCC project ref. 2711, GS 411 (available through the Gold Standard, www.cdmgoldstandard.org, last accessed 19.08.2011)

<table>
<tr>
<td></td>
<td>Source: FAO (2010): Global Forest Resources Assessment 2010, Country Report Nigeria, p.26, http://www.fao.org/forestry/20262-1-1.pdf, last accessed on 12.10.2010

The “National Greenhouse Gas Inventory 1988-2000[30]” gives evidence that there is a dramatic decline of forestry areas in Nigeria due to land-use change, with an estimated loss of more than 54,000 km² of lowland rainforests (from 184,000 km² in 1989 to 130,000 km² in 2007). Equally, the Savannah area has dropped from 325,000 km² in 1989 to 230,000 km² in 2007, a loss of more than 100,000 km², and is expected to further decline in the coming years.</td>
<td></td>
</tr>
<tr>
<td>Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and</td>
<td>There is strong evidence that forests and other wooded land that is used for fuelwood sourcing is not sustainable managed. The FAO Forest Resource Assessment 2010 country report show a declining trend of carbon stocks in Nigeria due to the dramatic deforestation taking place. If forests or other wooded land was sustainably managed, carbon stocks and growing stock would not systematically decrease over time, however, this is the case, as can be seen from the tables below:

Carbon stock in living forest biomass in Nigeria

<table>
<tr><th rowspan="2">Country/area</th><th colspan="5">Carbon stock in living forest biomass (million tonnes)</th></tr>
<tr><th>1990</th><th>2000</th><th>2005</th><th>2010</th><th>Per hectare 2010 (tonnes)</th></tr>
<tr><td>Nigeria</td><td>2016</td><td>1550</td><td>1317</td><td>1085</td><td>120</td></tr>
</table>
Source: FAO (2010): Global Forest Resource Assessment 2010, Country Report Nigeria, p. 32, http://www.fao.org/forestry/20262-1-1.pdf

Growing stock from forest in Nigeria

<table>
<tr><th>Year</th><th>1990</th><th>2000</th><th>2005</th><th>2010</th></tr>
<tr><td>Forest area (1 000 ha)</td><td>17,234</td><td>13,137</td><td>11,089</td><td>9,041</td></tr>
<tr><td>Growing stock in forest and plantation (mio m³)</td><td>2,061</td><td>1,611</td><td>1,386</td><td>1,161</td></tr>
</table>
Source: FAO (2010): Global Forest Resources Assessment 2010, Country Report Nigeria, p.26, http://www.fao.org/forestry/20262-1-1.pdf, last accessed on 12.10.2010

Another study conducted in 5 Local Government Areas in Nigeria shows that the share of replacement to wood removal/consumption is below 10%, and that no trees (of this 10%) were planted for the purpose of fuelling. [31]</td>
<td>☒</td>
</tr>
</table>

30: Obioh, I. (2003): Trends in Greenhouse Gas Emissions in Nigeria: 1988-2000, p.92-94.

[31] Ogunkunle, A.T.J, Oladele, F.A.(2003): “Ethnobotanical study of fuelwood and timber wood consumption and Replenishment in Nigeria”, p. 232 ff., http://unilorin.edu.ng/publications/oladele/ETHNOBOTANICAL%20STUDY%20OF%20FUELWOOD%20AND%20TIMBER%20WOOD%20CONSUMPTION.pdf, last accessed 19.08.2011

Any national or regional forestry, agriculture and nature conservation regulations are complied with.	There is no general law that prohibits fuel wood extraction from forests, though for protected areas fuel wood extraction is not permitted. But illegal firewood extraction continues, as laws and regulations are not enforced. Forest resources and reserves are poorly managed, and there is a lack of consistent forestry policy to protect forest resources. Illegal harvest of non-timber outputs[32] is estimated as high as 90 percent, and some 40 percent in the case of timber.[33] As the evaluation report on implementation of national forest programmes in Nigeria[34] concludes, recent efforts to implement effective forest protection in Nigeria have largely failed: *"Forestry administration* *Forestry is administered in the country at the three tiers of government i.e. Federal, State and the Local Government Areas. The primary role of FDF is to formulate National Forest Policy. The primary role of FDF is to formulate National Forest Policy. It also plays an advisory role to the state Forestry Department; supports execution of Federally funded project and is responsible for relations with International Development Agencies. FDF is severely constrained by lack of funds to effectively perform its roles. The SFDs manage the Forest resources at the state level. They also superintend over revenue generation from the Forestry Sector in the states. Like FDF, crippling financial resources have not allowed the SFDs to perform their functions. In addition, there is shortage of manpower, and most of the available personnel lack adequate training and exposure to modern Forestry techniques. The roles of LGAs differ from North to South. In the south they have virtually no responsibility for managing the Forest resources, while the contrary is the case in the North. The LGAs are equally constrained by lack of funds and personnel to carry out their mandate.* *Forest Resources* *Nigeria currently has less than 10% of her total land area under constituted Forest Reserves. Recent studies using Remote Sensing and GIS show that undisturbed forest covers only 12,114 km^2 representing about 1.3% of the Country's total land area.* *Forest Management* *Forest management started in Nigeria as early as 1889 with the opening of the " office of woods and forests " in the then colony and protectorate*	☒

[32] Fuel Wood is considered as a non-timber forest product, see e.g. FAO: Contributions of selected Non-Timber Forest Products to Household Food Security in Osun State, Nigeria, http://www.fao.org/DOCREP/ARTICLE/WFC/XII/0182-A1.HTM, last accessed 15.02.2010

[33] Federal Department of Forestry (2001): The forest revenue system and government expenditure on forestry in Nigeria, p.46, ftp://ftp.fao.org/docrep/fao/003/X6818E/X6818E00.pdf, last accessed 15.02.2010

[34] FAO (2003): Experience of Implementing National Forestry Programmes in Nigeria, ftp://ftp.fao.org/docrep/fao/005/AC918E/AC918E00.pdf, last accessed 15.02.2010

	of Lagos. At the formative stage, due regard was given to standard forest management practices, thus bestowing a high degree of sanctity on the forestry sector. Forest reservation was virtually completed in the high forest areas by 1940. Tropical Shelterwood System was introduced but later abandoned while attempt at artificial regeneration through Taungya system started in 1926. The recent times have however, witnessed an absolute disregard for forest management. Forest reserve is thus not maintained while management plans are either nonexistent or abandoned. *Policy and Institutional Reforms* *The forestry Sector did not have a separate policy before the commencement of the National Forestry Action Programme. What obtained was an encapsulation of the National Forest Policy within an overall "Agricultural Policy for Nigeria" which was published in 1988 under the aegis of the Federal Ministry of Agriculture. The policy reform packaged in the NFAP has led to the setting up of two committees i.e. National Committee on Review of Forestry and /wildlife Legislation and the National Forest Policy Review Committee. The National Committee on Review of Forestry and Wildlife Legislation has finalised a bill to be forwarded for consideration by the National Assembly while the second committee has visited some Southern African countries and Malaysia to put in proper perspective their input to the new National Forestry Policy. […]* *Economic viability of National Forest Programmes* *The country records deficit in all areas of her wood needs. The demand for Industrial wood far outstrips production except in the case of pulp and paper probably because the mills are not working. The situation with the fuelwwod and NTFPs portends serious danger to the country. The states Forestry Department are not properly funded. Most of their allocations are devoted to payment of salaries and wages. The situation is similar with FDF, which has not been able to properly fund the Field Offices to discharge their normal duties. The Forestry Sector has benefited substantially from International Funding Agencies, which have financed laudable programmes ranging from plantation establishment to Landuse and Vegetation Survey. The revenue generated by SFDs is not substantial. Factors responsible for this low revenue generation include inappropriate pricing of Forest products, undervaluation of Forests and collusion of Forestry Staff with forest exploiters to defraud government"* To conclude, laws and regulations concerning the protection of forestry areas exist in Nigeria but are not enforced.	

Therefore, following this assessment, one can reasonably assume that the quantity of DRB is 0, and NRB = 1

However, in order to be conservative, though the assessment above demonstrates that there is no demonstrably renewable biomass as none of the three conditions are satisfied, and therefore we could

argue for a 100% Non Renewable Biomass Baseline, we will consider that in some cases, woody biomass may be procured e.g. from dead wood, or from locally practiced agro-forestry systems. Furthermore, we are taking into account that there is already a registered CDM project in Nigeria (Ref. 2711) applying a NRB factor of 77%. (Data Source for this assessment: FAO (2003): Experience of Implementing National Forestry Programmes in Nigeria, see ftp://ftp.fao.org/docrep/fao/005/AC918E/AC918E00.pdf) Though this NRB factor was determined following the guidance of version 1 of the methodology, whereas from version 2 onwards a much stricter criterion for classifying woody biomass as renewable was introduced (the concept of "demonstrably renewable woody biomass"), we will apply a 0.77 net to gross adjustment factor and hence $f_{NRb,y} = 0.77$. The factor of 0.77 is more conservative than the factor of 1, as is the outcome of the assessment, since 0.77 < 1, and hence reduction of emission reduction by 23%.

Step 3: Determination of the Net calorific value of the non-renewable woody biomass that is substituted

AMS II.G. requests to use the IPCC default value for the non-renewable woody biomass that is substituted.
Therefore, $NCV_{biomass} = 0.015$ TJ/tonne

Step 4: Determination of the fossil fuel likely to be used by similar consumers

According to AMS II. G., the emission factor for the substitution fuel likely to be used is to be taken. AMS II.G. requests to use a default value of 81.6 t CO_2/TJ.

Explanation of methodological choices regarding monitoring:

According to AMS II.G., ver. 3, par. 15 and par. 16,

"Monitoring shall consist of checking the efficiency of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating at the specified efficiency (η_{new}) or replaced by an equivalent in service appliance. Where replacements are made, monitoring shall also ensure that the efficiency of the new appliances is similar to the appliances being replaced.

Monitoring shall also consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to determine if they are still operating or are replaced by an equivalent in service appliance."

A representative sample of the appliances disseminated under a CPA will be monitored to determine the share of appliances that are still operating at the specified efficiency. Where appliances are found to be operational but with a changed efficiency the actual efficiency determined in monitoring will be applied to calculate emission reductions. Replacement of appliances is monitored and the replaced devices will have same efficiency . The procedures for monitoring the share of operational appliances and their respective efficiency(ies) are laid out in section E.7.

Further, par. 17, 18 & 21 of the AMS II.G, ver. 3 are not applicable as they refer to options not chosen for this PoA:

Par. 17: "If the quantity of fuel saved is determined using the Kitchen Performance Test (i.e. paragraph 6, Option 1), monitoring shall ensure that fuel consumption during the period of the project activity is monitored annually. "

Not applicable as Option 2 of par. 6 is chosen to determine $B_{y,savings}$

par. 18 & 21: "If option (b) in paragraph 7 is chosen for determining B_{old}*, monitoring shall include the amount of thermal energy generated by the project technology t in year y."*

Not applicable as Option (a) of par. 7 is chosen to determine B_{old}

par. 19 reads:

"In order to assess the leakage described above, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources). Other data on non-renewable woody biomass use required for leakage assessment shall also be collected."

par. 19 does not need to be considered for monitoring, as the net-to gross adjustment factor for L_{nrb} was used:

According to par. 20, monitoring shall ensure that:

"Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or

If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from B_{old}*."*

Monitoring of the proper disposal of old appliances is complicated, especially if the old appliance is a three stone fire, we choose option (b). The continuous use of baseline appliances will be excluded from B_y by determining the number of eaters per appliance during monitoring (see Section E 7.1)

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:

>>

According to AMS II. G., ver. 3, emission reductions shall be calculated using the following equation:

Equation 15

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

Parameter	Unit	Description
ER_y	tCO_2	Emission reductions of the project activity in period *y*
$B_{y,savings}$	t	Quantity of woody biomass that is saved by the CPA in period y
$f_{NRB,y}$	-	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass (fixed parametric value of 0.77 as

		per assessment in Section E.6.1)
$NCV_{biomass}$	TJ/t	Net calorific value of the non-renewable woody biomass that is substituted (fixed parametric value of 0.015 TJ/tonne, IPCC default for wood fuel)
$EF_{projected\_fossilfuel}$	tCO_2/TJ	Emission factor for the substitution of non-renewable woody biomass by similar consumers (fixed parametric value of 81.6 tCO_2/TJ, AMS II.G. Default Value)

$B_{y,savings}$ shall be calculated according to the following formula, according to AMS II.G., par. 6, Option 2:

Equation 16

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

Parameter	Unit	Description
$B_{y,savings}$	t	Quantity of woody biomass that is saved by the CPA in period y
B_{old}	T	Quantity of woody biomass used in the absence of the project activity
η_{old}	%	Efficiency of the baseline system being replaced (fixed parametric value of 0.1, AMS II.G. Default Value)
η_{new}	%	Efficiency of the system being deployed as part of the project activity (monitored parametric value)

For calculating $B_{y,savings}$ a CPA shall calculate efficiency gains of the improved cook stove compared to the baseline efficiency.
The efficiency testing is based on thermal efficiencies of the baseline and project appliances in terms of share of the energy content of the biomass fuel that is converted into cooking energy. As per the AMS II.G, ver. 3 requirements, the efficiency is determined using the Water Boiling Test (WBT) protocol.[35].

B_{old} shall be calculated according to the following formula (see Section E.6.1 for explanation):

Equation 17

$$B_{old} = B_{old,appliance} \cdot N_y \cdot (1 - DO_y) \cdot \frac{mp_{length}}{365} \cdot L_{NRB} \cdot L_{PoA}$$

Parameter	Unit	Description

[35] See for a description of the protocol for example: http://www.berkeleyair.com/publications/cat_view/42-publications, last accessed 03.05.2011

B_{old}	t	Quantity of woody biomass used in the absence of the project activity
$B_{old,,appliance}$	t/year	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
N_y	-	Adjusted total number of appliances deployed in period y (monitored parametric value)
DO_y	%	Statistically adjusted drop out from total population of appliances in period y (monitored parametric value)
mp_{length}	days	Length of monitoring period y
L_{NRB}	-	Net-to-gross adjustment factor for NRB Leakage (fixed parametric value of 0.95, AMS II.G. Default Value)
L_{PoA}	-	Net-to-gross adjustment factor for PoA Leakage (fixed parametric value of 0.95, AMS II.G. Default Value)

The value $B_{old,appliance}$ is derived from per capita fuelwood consumption as described in Section E.6.1, multiplied with the average number of eaters per appliance as determined during monitoring. Therefore, $B_{old,,appliance}$ shall be calculated according to the following formula:

Equation 18

$$B_{old,appliance} = B_{old,capita} \cdot N_{eaters,appliance}$$

Parameter	Unit	Description
$B_{old,,appliance}$	t/year	Quantity of woody biomass used in the absence of the project activity in tonnes, per appliance
$B_{old,capita}$	t/year	Average baseline fuelwood consumption per capita per year (fixed parametric value of 0.692 t/year, see Section E.6.1)
$N_{eaters,appliance}$	-	Average number of eaters per project appliance (monitored parametric value, capped as per parameter HH_CAP, see below)

E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:

List of parameters and parametric values that are fixed for all CPAs under this PoA:

Data / Parameter:	$B_{old,capita}$

Data unit:	t/year
Description:	Average baseline fuelwood consumption per capita per year
Source of data used:	UN Statistics Database, Value for 2006; Nigeria Census Data 2006
Value applied:	0.692
Justification of the choice of data or description of measurement methods and procedures actually applied :	The United Nations Statistics Division has published fuelwood consumption figures for households in Nigeria. To arrive at the per capita consumption, this figure is divided by the total population in Nigeria. The population data is taken from official census. Both data are taken from the same, most recent year for consistency reason. See Section E.6.1 for details.
Any comment:	

Data / Parameter:	η_{old}
Data unit:	%
Description:	Efficiency of the baseline system being replaced
Source of data used:	AMS II.G. (Ver. 3)
Value applied:	0.10
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to AMS II.G., ver. 3, a default value of 0.10 can be used "if the replaced system is the three stone fire or a conventional system lacking improved combustion air supply mechanism and flue gas ventilation system i.e., without a grate as well as a chimney". See Section E.6.1
Any comment:	

Data / Parameter:	L_{NRB}
Data unit:	-
Description:	Net-to-gross adjustment factor for NRB Leakage (fixed parametric value of 0.95,)
Source of data used:	AMS II.G. (Ver. 03)
Value applied:	0.95
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methodology AMS II.G, ver. 3, a default value as provided under par. 13 can be optionally used to account for leakages, in which case surveys are not required. See Section E.6.1 for details.
Any comment:	

Data / Parameter:	L_{PoA}
Data unit:	-
Description:	Net-to-gross adjustment factor for PoA Leakage (fixed parametric value of 0.95, AMS II.G. Default Value)

Source of data used:	AMS II.G. (Ver. 03)
Value applied:	0.95
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methodology AMS II.G, ver. 3, a default value as provided under par. 23 can be optionally used to account for potential PoA leakages, in which case estimates of the leakage is not required. See Section E.6.1 for details.
Any comment:	

Data / Parameter:	$f_{NRB,y}$
Data unit:	-
Description:	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass
Source of data used:	FAO (2010): Global Forest Resource Assessment 2010, Country Report Nigeria, http://www.fao.org/forestry/20262-1-1.pdf
Value applied:	0.77
Justification of the choice of data or description of measurement methods and procedures actually applied :	Though the NRB assessment comes to the conclusion that 100% of the woody biomass available to the end users is none-renewable, since none of the three conditions outlined in the methodology AMS II.G., ver. 3, par. 9 are fulfilled and hence it cannot be shown that demonstrably renewable woody biomass exists, a lower factor is used to be conservative. See Section E.6.1 for details.
Any comment:	

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/t
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data used:	AMS II.G (Ver. 3)
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the IPCC default value for wood fuel as provided by AMS II.G (Ver. 03), par. 5
Any comment:	

Data / Parameter:	$EF_{projected\_fossilfuel}$
Data unit:	tCO_2/TJ
Description:	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data used:	AMS II.G (Ver. 3)
Value applied:	81.6
Justification of the choice of data or	This is the IPCC default value as provided by AMS II.G, ver. 3, par. 5

description of measurement methods and procedures actually applied :	
Any comment:	

List of parameters and parametric values that are determined at time of inclusion of the CPA into the PoA and stay fixed throughout the crediting period of the CPA.

Data / Parameter:	***HH_CAP***
Data unit:	Number
Description:	Maximum number of eaters possible per specific ICS as applied in the specific CPA
Source of data used:	Manufactures specifications
Value applied:	To be completed in any specific CPA DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to manufactures specifications
Any comment:	

Data / Parameter:	$\eta_{specified}$
Data unit:	%
Description:	Efficiency of the system being deployed as per manufacturer specification
Source of data used:	Manufactures specifications
Value applied:	To be completed in any specific CPA DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to manufactures specifications
Any comment:	Note that $\eta_{specified}$ is the efficiency as per manufacturer specification for fulfilling eligibility criterion 2. This value will not be used for ex-post calculation of emission reductions since η_{new} is a monitored parameter to reflect possible changes in efficiency during the lifetime of the ICS.

E.7. Application of the monitoring methodology and description of the monitoring plan:

E.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	$N_{eaters\ ,appliance}$
Data unit:	-
Description:	Average number of eaters per appliance

Source of data used:	Primary data collection: dedicated monitoring team; database maintenance: managing entity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be completed in any specific CPA DD. The value will be between 0 and HH_CAP: $0 \le N_{eaters\ ,appliance} \le HH\_CAP$ For ex-ante estimate in the CPA DD, HH_CAP will be used.
Description of measurement methods and procedures to be applied::	Monitoring of the statistically adjusted average number of eaters involves two steps: Step 1: Sample survey amongst appliances of the same type deployed under CPAs of the PoA as specified in section E.7.2 Step 2: Calculation of the average number of eaters at confidence level and precision as required by the methodology (AMS II.G. ver. 3) for the inspection frequency chosen, following the statistical standard approach for a homograde test of independent units that have a standard normal distribution. The average number of eaters will be determined through interviews performed by a dedicated monitoring team according to the sampling procedure described in section E.7.2. Interviews will be reported in a questionnaire. Interviews are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the managing entity that takes care of entering the information to an electronic database and updating databases where appropriate. By determining the average number of eaters per appliance, the continuous use of the baseline appliance is considered as only the baseline consumption which is reduced by the project appliance is considered. See Section E.6.1, Step 1.1.1 for details.
QA/QC procedures to be applied:	All formulas applied to determine the statistical precision used are standard formula. Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (*"...the lower bound of a [...] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of appliances. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Any comment:	

Data / Parameter:	N_y
Data unit:	-
Description:	Adjusted total number of appliances deployed until period y

Source of data to be used:	Sales Records Database
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be completed in any specific CPA DD
Description of measurement methods and procedures to be applied:	The total number of appliances deployed until period y is calculated based on information monitored through the sales records database. $N_y = \sum_{i=1}^{y} n_i \cdot OT_{adjusted,i,y}$

Parameter	Unit	Description
n_i	-	Number of appliances deployed in period i as reported in the sales records database and adjusted to account for delays between sales date and first use. Every appliance starts to operate (deployment date) in the month following the month in which the appliance was sold.
$OT_{adjust,i,y} = \begin{cases} 1 & ,i < y \\ \frac{d_{average,y}}{mp_{length}} & ,i = y \end{cases}$	-	Adjustment factor for reduced operational time of appliances deployed in monitoring period y, whereas i = 1, …, y. For all appliances deployed in the periods *i* prior to Monitoring period *y*, the adjustment factor is 1.
$d_{average,y}$	days	Average number of days that appliances deployed in period y have been operational in period y as determined by respective deployment dates of appliances counted for n_y . Deployment dates are determined mutatis mutandis as in the context of n_i above.
mp_{length}	days	Length of monitoring period y

QA/QC procedures to be applied:	Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.
Any comment:	Type of the stove will also be monitored via sampling approach or documented evidences, and in case any deployed ICS type will be found not in line with the methodology requirement, those ICS will not be counted for emission reduction

	calculation.

Data / Parameter:	DO_y
Data unit:	%
Description:	Statistically adjusted drop out from total population of appliances in period y Drop out means that the ICS are either not used, outside of the project boundary (i.e. outside Nigeria) or damaged beyond repair.
Source of data to be used:	Primary data collection: dedicated monitoring team; database maintenance: managing entity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be completed in any specific CPA DD
Description of measurement methods and procedures to be applied:	Monitoring of the statistically adjusted drop out involves two steps: Step 1: Sample survey amongst appliances of the same type deployed under CPAs of the PoA as specified in section E.7.2 Step 2: Calculation of the adjusted drop out rate at confidence level and precision as required by the methodology (AMS II.G. ver. 3) for the inspection frequency chosen, following the statistical standard approach for a homograde test of independent units that have a standard normal distribution. The Drop outs will be determined through interviews where it will be checked if the appliances are still operational, performed by a dedicated monitoring team according to the sampling procedure described in section E.7.2. Interviews will be reported in a questionnaire. Checks are conducted until the required precision for this parameter is achieved. All questionnaires and information gathered during the sampling by the monitoring team are handed over to the managing entity that takes care of entering the information to an electronic database and updating databases where appropriate.
QA/QC procedures to be applied:	All formulas applied to determine the statistical precision used are standard formula. Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (*"...the lower bound of a [...] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of appliances. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. A traceable "identity check" of the appliances visited during sampling shall be

	performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.).
Any comment:	

Data / Parameter:	η_{new}
Data unit:	%
Description:	Adjusted average efficiency of the system being deployed
Source of data to be used:	Primary data collection: dedicated monitoring team; database maintenance: managing entity
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be completed in any specific CPA DD. The value will be between 0 and $\eta_{specified}$: $0 \leq \eta_{new} \leq \eta_{specified}$ For ex-ante estimate in the CPA DD, $\eta_{specified}$ will be used.
Description of measurement methods and procedures to be applied:	Monitoring of the statistically adjusted average efficiency involves two steps: Step 1: Sample survey amongst appliances of the same type deployed under CPAs of the PoA as specified in section E.7.2 Step 2: Calculation of the average efficiency at confidence level and precision as required by the methodology (AMS II.G. ver. 3) for the inspection frequency chosen, following the statistical standard approach for a heterograde test of independent units that have a standard normal distribution. η_{new} is determined following the Water Boiling Test (WBT), performed by a dedicated monitoring team according to the sampling procedure described in section E.7.2. Tests will be reported in spreadsheet templates. Checks are conducted until the required precision for this parameter is achieved.
QA/QC procedures to be applied:	All formulas applied to determine the statistical precision are standard formula. Furthermore, according to AMS II.G (ver. 3), par.22 the sampling error has to be deducted (*"...the lower bound of a [...] confidence interval of the parameter value may be chosen"*) in the event that the required precision could not be achieved because of a small sample size. No deductions have to be made if the precision is achieved by sampling a proper number of appliances. Data will be collected using the standard procedures and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. A traceable "identity check" of the appliances visited during sampling shall be performed and recorded (e.g. a picture of the appliance clearly showing its serial no., etc.). Cross-checks: The monitoring team will cross-check results with the efficiency as determined at CPA inclusion stage. Additionally, literature values may also be used to compare the results. .
Any comment:	

E.7.2. Description of the monitoring plan for a SSC-CPA:

>>

According to AMS II.G (ver. 3), par. 15 and 16, *"Monitoring shall consist of checking the efficiency of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating at the specified efficiency (η_{new}) or replaced by an equivalent in service appliance. Where replacements are made, monitoring shall also ensure that the efficiency of the new appliances is similar to the appliances being replaced.*
Monitoring shall also consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to determine if they are still operating or are replaced by an equivalent in service appliance"

Furthermore, according to par. 20, monitoring shall ensure that:

"Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or

If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from B_{old}."

For this reason, the parameters as stated in Section E.7.1. are monitored. Whereas N_y is monitored through sales records for all appliances deployed, the other parameters will be determined through sample surveys, as, due to the high number of appliances to be deployed an annual check of operation and efficiency of all appliances is not economically feasible and therefore a sample will be monitored to ensure that all the appliances deployed are still operating or to record end of operation and/or replacement of the appliances, and to check efficiency of the appliances deployed.

This is in line with methodology AMS II.G., ver. 3, par. 22, stating that

"A statistically valid sample of the locations where the systems are deployed, with consideration, in the sampling design, of occupancy and demographics differences can be used to determine parameter values used to determine emission reductions, as per the relevant requirements for sampling in the "General guidelines for sampling and surveys for small-scale CDM project activities". When biennial inspection is chosen a 95% confidence interval and a 5% margin of error requirement shall be achieved for the sampling parameter. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/5 precision is not achieved, the lower bound of a 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/5 precision."

Please note that sampling may be across CPAs deploying the same ICS type, i.e. the same appliance, to reduce monitoring efforts, since this will not affect the precision/ confidence requirements of the methodology, as long as the inspection frequency is met.
The inspection frequency will (i.e annual or biennial) depend on the trade-off between costs and precision requirement, and therefore we cannot determine ex-ante in this PoA-DD or in the CPA-DDs which inspection frequency will be chosen, but in the following we will describe the sampling approach which will be followed.

To ensure completeness and accuracy of monitoring information, electronic database(s) will be operated and maintained by the managing entity.

The following figure illustrates the monitoring approach and corresponding databases:

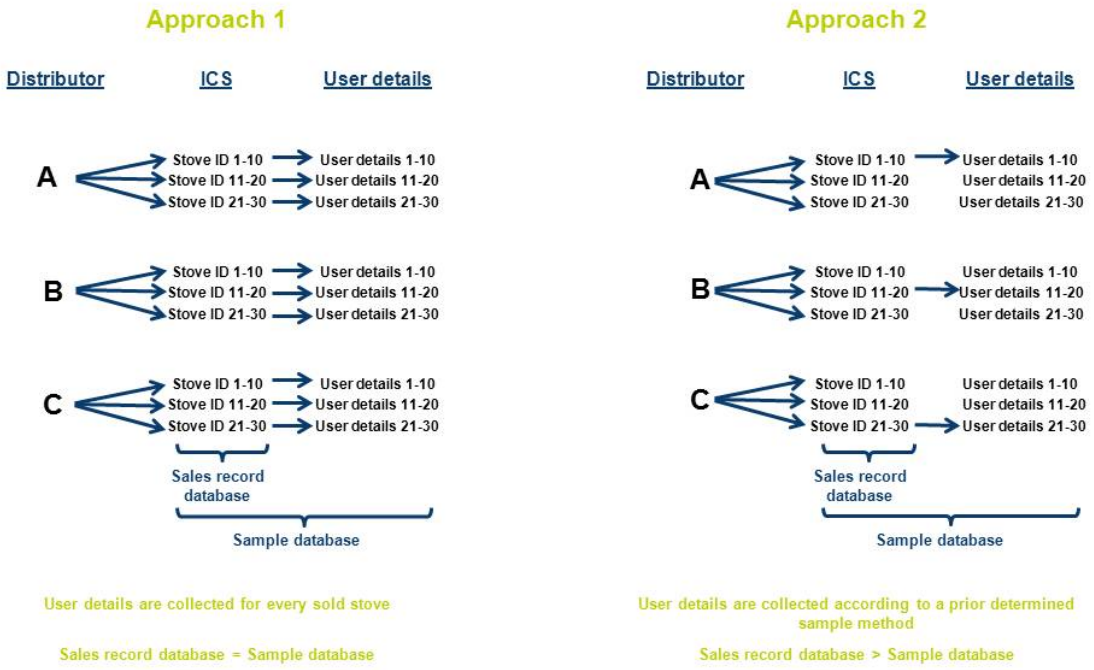

Figure 3: Monitoring approach

The sample database can be equal to the sales record data base (in terms of size), if user details of all ICS users are collected (approach 1). If user details are collected only from a representative sub-fraction of all users (approach 2), the sample database will be smaller than the sales record database (in terms of size)

Sales records database(s)

The sales records database will keep information on all appliances deployed, to determine N_y. At least the following information will be recorded:

- Serial number of appliance sold
- Sales date
- CPA-ID (CPA to which the appliance belongs to)

The information in this database will be updated continuously.

Sample database

The sample database will keep information on all (approach 1, in that case, the sample database and the sales records database are the same) or a representative sub-fraction (approach 2) of appliances deployed,

to draw sample for the parameters determined via sampling. At least the following information will be recorded:

- Serial number of appliance sold
- Sales date
- CPA-ID (CPA to which the appliance belongs to)
- User details (Name, State, Local Government Area (LGA), Address if available, etc.)

The information in this database will be updated continuously.

Inspection Database

The Inspection database will keep information on a sub-fraction of appliances deployed, which were selected from the sample database. At least the following information will be recorded:

- Serial number of appliance checked
  CPA-ID (CPA to which the appliance belongs to)
  Information as determined during monitoring:

- Continuous operation of appliance (yes/no) (to determine parameter DO_y,) and/or
- Average N° of eaters per appliance (to determine parameter $N_{eaters\ ,appliance}$) and/or
- Efficiency tested (to determine parameter η_{new})
- Date of the check

The information in this database will be updated for every Monitoring period.

Sampling methodology

To reduce monitoring efforts a single sample is drawn (the Inspection database) based on which all of the parameters determined via sampling shall be monitored. This does not imply that for each of the parameters the same number of users/appliances has to be monitored during sampling. The managing entity will determine the number of users/appliances monitored during sampling for each of the parameters separately. The reason is that the variation within the values obtained will be different for each parameter. Since the precision of a sampled parameter depends on the variation of its values, the necessary number of users/appliances to be monitored in order to achieve the 5% or 10% precision will also depend on the variation of values. Therefore, although the monitoring team will undertake monitoring of various parameters simultaneously and on the same sample, the managing entity may decide to stop monitoring of a particular parameter during the campaign once the required precision for this parameter is achieved. The monitoring team will continue to monitor appliances in the sample with respect to the remaining parameter(s) until again the required precision for these parameters is achieved.

The following steps will be carried out for representative sampling, in consideration of the General Guidelines for sampling and surveys for small-scale CDM project activities (http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid20.pdf). For each monitoring period, either approach 1 or approach 2 will be chosen. Approach 1 is the preferred approach.

Approach 1: Multistage sampling with sales record database = sample database (in terms of number of cases)

Step 1: For each monitoring period *y* contact details from users are collected. In this case the sales record database is equal to the sample database. In order to obtain a final representative selection (Inspection database), the following steps are undertaken:

Step 2: In order to reflect the different age of the ICS (i.e. the different deployment dates), the relative share of appliance vintages within the total population of appliances deployed as recorded in the sales record database under the CPAs shall be established. At least one ICS per Monitoring Period shall be part of the final selection, if any ICS were sold in this Monitoring Period. Example: If after the second monitoring period, 75% of all appliances were deployed until the end of the first Monitoring Period, and 25% were deployed until the end of the second Monitoring Period, than the final selection shall also represent that share.

Step 3: A sample of administrative clusters (e.g. LGAs, Local Government Areas) is selected for each monitoring period *y* from the sample database by "probability proportional to size"-sampling, i.e. clusters with a higher number of appliances deployed will have a higher chance to be selected than those with a smaller number of appliances.

Step 4: A fixed number of users within the selected clusters will be randomly selected by means of a computerized randomizer. The number of users to be selected shall be equal for all clusters.

Approach 2: Multistage sampling with sales record database > sample database (in terms of number of cases)

Step 1: For each monitoring period *y* a representative sample of all appliances (sample database) deployed in the period *y* shall be established by randomly select a number of administrative units (e.g. LGAs) and/or distributors for which user details are collected during a fixed period of time (e.g. one week or one month). In order to obtain a final representative selection (Inspection database), the following steps are undertaken, which are similar to the steps as under approach 1:

Step 2: In order to reflect the different age of the ICS (i.e. the different deployment dates), the relative share of appliance vintages within the total population of appliances deployed as recorded in the sales record database under the CPAs shall be established. At least one ICS per Monitoring Period shall be part of the final selection, if any ICS were sold in this Monitoring Period. Example: If after the second monitoring period, 75% of all appliances were deployed until the end of the first Monitoring Period, and 25% were deployed until the end of the second Monitoring Period, than the final selection shall also represent that share.

Step 3: A sample of administrative clusters (e.g. LGAs, Local Government Areas) is selected for each monitoring period *y* from the sample database by "probability proportional to size"-sampling, i.e. clusters with a higher number of appliances deployed will have a higher chance to be selected than those with a smaller number of appliances.

Step 4: A fixed number of users within the selected clusters will be randomly selected by means of a computerized randomizer. The number of users to be selected shall be equal for all clusters.

Other sampling methods which may be more practical and cost effective may alternatively be used, while considering the most recent General Guidelines for sampling and surveys for small-scale CDM project activities (http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid20.pdf). If this is the case, the DOE will have to verifiy at verification stage that the sampling method was statistically sound and as robust as the approaches presented in this PoA-DD.

Organisational structure of sampling

Person	Role
Managing Entity database administrator	The database administrator is responsible for updating and maintaining all electronic databases.
Monitoring team	The monitoring team will be assigned by the CME to conduct the user interviews and appliance tests during the periodic sampling and reports the results to the database administrator.

Random distribution
The method of selecting users to be included in the sample databases for deployed appliances will be random (in case of approach 2, in case of approach 1 all users will be included in the sample database). The method of selecting users for the inspection database for checks will be random. All random selections will be stored for the crediting period and an additional two years. Therefore, traceability of the selection is provided.

Representative sampling
It shall be assured that the sample database is always statistically representative for the respective appliance vintages. For all parameters that are monitored via sampling it is understood that only the ICS age has an influence. Therefore, no geographic representativeness is deemed necessary for the selection of users participating in these sample groups.

Interviews and tests
The periodical inspection checks will be performed by user interviews and appliance tests. Only persons that are of legal age will be interviewed.

Training
The managing entity will provide training or second trainers to the monitoring team and to the distributors to ensure accuracy and completeness of data recorded.

Monitoring report to be provided to Verification Entity:
The managing entity is responsible for preparing the Monitoring Report with the support of the monitoring team.

Procedure for QA/QC
Data collected and processed by the field staff will be checked regularly by the CME or a person dedicated by the CME.

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

12/11/2010, Florian Zerzawy, atmosfair gGmbH, Dr. Paul Kraemer, Lernen Helfen Leben e.V.

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

Organization:	atmosfair gGmbH
Street/P.O.Box:	Zossener Straße 55
Building:	Aufgang D, 6. OG
City:	Berlin
State/Region:	Berlin
Postfix/ZIP:	10961
Country:	Germany
Telephone:	+49 30 627 3550-0
FAX:	+49 30 627 3550-29
E-Mail:	info@atmosfair.de
URL:	www.atmosfair.org
Represented by:	Florian Zerzawy
Title:	CDM Project Developer
Salutation:	
Last Name:	Zerzawy
Middle Name:	
First Name:	Florian
Department:	CDM Project Development
Mobile:	
Direct FAX:	+49 30 627 3550-29
Direct tel:	+49 30 6273550-21
Personal E-Mail:	zerzawy@atmosfair.de

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding of the PoA. All subsidies for the project are stemming from CDM revenues.

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

- - - - -