Programme of activities design document form
(Version 09.0)

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

BASIC INFORMATION	
Title of the PoA	Distribution of fuel-efficient improved cooking stoves in Nigeria
Version number of the PoA-DD	~~11~~14.~~1~~15
Completion date of the PoA-DD	~~17/01/2017~~27/~~04/~~01/07/2020
Coordinating/managing entity	C-Quest Capital LLC
Host Parties	Nigeria
Applied methodologies and standardized baselines	AMS II.G, version ~~3~~11, Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass
Sectoral scopes	Sectoral Scope 3- Energy Demand

PART I. Programme of activities (PoA)

SECTION A. Description of PoA

A.1. Purpose and general description of PoA

>>
The following information shall be included here:

1. General operating and implementing framework of PoA

This programme of activities is a non- A/R activity and involves the promotion, distribution and sale of fuel-efficient improved cooking stoves (ICS) in Nigeria. The ICS disseminated through this programme will replace the prevailing inefficient three-stone fires or equivalent with stoves which combust wood more efficiently, and improve thermal transfer to pots, hence saving fuel and lowering greenhouse gas emissions.

The SSC-PoA will be coordinated by C-Quest Capital LLC (CQC) ICS will be sold on a commercial basis. Carbon finance will be used to facilitate the purchase, distribution and marketing of stoves, without which the activities would not take place.

Sales information will be gathered directly from customers and stored on a database. Registration of stoves will also constitute an informed agreement to transfer CERs generated to CQC.

2. Policy/measure or stated goal of the SSC-PoA

The goal of this SSC-PoA is to introduce cleaner, more efficient improved cooking stoves (ICS) to many peri-urban and rural households across Nigeria who, at present, use rudimentary stoves or three-stone fires which are inefficient and smoky. In turn, this will reduce global greenhouse gas emissions by increasing the efficiency of cooking and reducing the quantity of non-renewable biomass consumed. ICS will also reduce indoor air pollution levels and the various health risks associated with breathing polluted air; and result in a range of social and economic benefits to users.

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

There are no laws, policies or mandatory requirements in Nigeria stipulating or encouraging the adoption of ICS by households. Indeed, this is acknowledged as a neglected policy area[1].

This SSC-PoA is a voluntary action by the coordinating and managing entity CQC.

4. Contribution of the proposed SSC-PoA to sustainable development

79.6%[2] of the population in Nigeria use wood for cooking, amounting to around 20 million households. There is a very low prevalence of improved technologies for combusting wood cleanly and efficiently. Majority of people use three-stone fires with three stones to support pots, or simple locally-fabricated metal pot supports.

[1] Sesan, T. 2010. Energy without the Dirt? Making a Case for Integration of Biomass into Energy Policy. *Boiling Point*, no. 57.

[2] National Bureau of Statistics. 2009. Social Statistics in Nigeria. Table 2.9.

The use of inefficient wood burning stoves and three-stone fires in homes has been found to cause considerable disease and death, particularly among women and children. The World Health Organisation[3] has found that 40% of all childhood pneumonia can be attributed to exposure to smoke from fires in homes, and exposure to smoke has been found to cause chronic lung disease in women. Approximately 1.5 million people die from smoke inhalation each year; most are women and children in low-income countries. Ill health can result in loss of productivity and costs associated with health care.

In many parts of Africa wood collection is a time-consuming burden that falls mainly on women[4]. Where wood is purchased (particularly in peri-urban areas in Nigeria) it poses a significant financial burden on families. Average annual incomes in Nigeria are said to be around US$330[5], while average household weekly fuel expenditure in Kaduna State is around ~~₦~~709 (US4.43)[6]. This equates to 70% of an individual income being devoted to fuel purchase.

The inefficient use of wood also places considerable and unnecessary pressure on local ecosystems and biomass resources, including forests. Reducing consumption of firewood can reduce this pressure. ~~Below is the estimated number of CERs likely to be created by this program based on the likely number of CPAs~~

~~Year~~	~~Number of New CPAs~~	~~Cumulative CPAs~~	~~Estimation of overall emission reductions (t of CO_2 eq)~~
~~07/11/2012-06/11/2013~~	~~1~~	~~1~~	~~46,717~~
~~07/11/2013-06/11/2014~~	~~1~~	~~2~~	~~93,434~~
~~07/11/2014-06/11/2015~~	~~2~~	~~4~~	~~186,868~~
~~07/11/2015-06/11/2016~~	~~2~~	~~6~~	~~280,302~~
~~07/11/2016-06/11/2017~~	~~2~~	~~8~~	~~373,736~~
~~07/11/2017-06/11/2018~~	~~1~~	~~9~~	~~420,453~~
~~07/11/2018-06/11/2019~~	~~0~~	~~9~~	~~420,453~~
~~07/11/2019-06/11/2020~~	~~0~~	~~9~~	~~420,453~~
~~07/11/2020-06/11/2021~~	~~0~~	~~9~~	~~420,453~~
~~07/11/2021-06/11/2022~~	~~0~~	~~9~~	~~420,453~~
~~**Total** (tonnes of CO_2 e)~~	~~**3,083,322**~~	~~**Total** (tonnes of CO_2 e)~~	~~**3,083,322**~~
~~**Total Number of Crediting Years**~~	~~10~~	~~**Total Number of Crediting Years**~~	~~10~~
~~**Annual Average**~~	~~308,332~~	~~**Annual Average**~~	~~308,332~~

A.2. Physical/geographical boundary of PoA

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Definition of the boundary for the SSC-PoA in terms of a geographical area (e.g., municipality, region within a country, country or several countries) within which all small-scale CDM programme

[3] World Health Organisation World Health Report, 2002

[4] Biran, A., J. Abbot, and R. Mace. 2004. Families and firewood: A comparative analysis of the costs and benefits of children in firewood collection and use in two rural communities in Sub-Saharan Africa. *Human Ecology* 32, no. 1: 1-25

[5] Centre for Global Development, https://www.cgdev.org/blog/buyback-resolve-nigerias-debt-problem

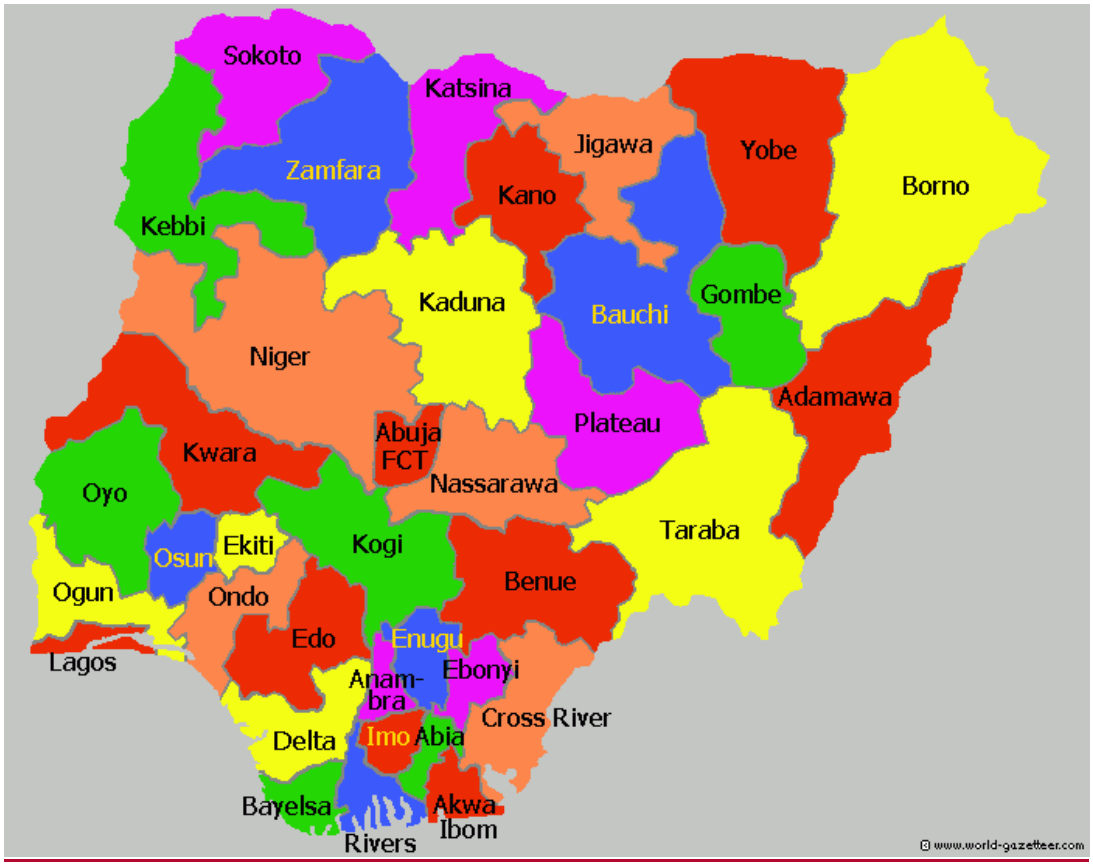
[6] Baseline Woodfuel Consumption Survey, Nigeria, Kaduna state: Outline summary and analysis of data. Jonathan Rouse, HED Consulting. For C Quest Capital LLC. August 30 2010

activities (SSC-CPAs) included in the SSC-PoA will be implemented, taking into consideration the requirement that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary;

All SSC-CPAs included in this SSC-PoA will be implemented within the geographical boundary of ~~either Kaduna State and/or Kano State,~~ Nigeria, indicated in the map below and includes all areas (rural, peri-urban and urban).

Kano and Kaduna State, Nigeria	
Kano State	
Northern Point Latitude: 12.566667° Longitude: 08.483333°	Western Point Latitude: 11.483333° Longitude: 07.683333°
Eastern Point Latitude: 11.550000° Longitude: 09.350000°	Southern Point Latitude: 10.533333° Longitude: 08.733333°
Kaduna State	
Northern Point Latitude: 11.483333° Longitude: 08.100000°	Western Point Latitude: 10.450000° Longitude: 06.083333°
Northern Point Latitude: 10.333333° Longitude: 08.783333°	Northern Point Latitude: 09.000000° Longitude: 08.550000°

Map of Nigeria (Kaduna State highlighted in red, Kano State in pink)



Map of Nigeria

A.3. Technologies/measures

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The activities under the proposed SSC-PoA will promote improved cooking stoves that result in substantially reduced fuel consumption and emissions for conducting cooking and water heating tasks in homes. The ICS used in this SSC-PoA have characteristics that improve the efficiency of combustion and thermal transfer to the pot compared with a traditional stove or three-stone fire. Most do this by incorporating a 'rocket elbow'; a highly-insulated combustion chamber which provides a conducive environment for clean and efficient combustion of wood. ICS substantially reduce woodfuel consumption compared with a three-stone fire. Efficiency of the ICS shall be established by a national standards body or an appropriate certifying agent recognized by it, or alternatively manufacturers' specification shall be used.

Specific stoves types will be described for each SSC-CPA.

A.4. Coordinating/managing entity

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>>The following information shall be included here:

1. Coordinating or managing entity of the SSC-PoA as the entity which communicates with the Board - C-Quest Capital LLC (CQC) will be Coordinating/Managing Entity of this SSC-PoA and is the entity which communicates with the CDM Executive Board.

~~2. Project participants being registered in relation to the SSC-PoA. Project participants may or may not be involved in one of the CPAs related to the SSC-PoA - C-Quest Capital LLC is currently the only project participant to the PoA (project participant may or may not be involved in one of the component project activities (CPAs) related to the PoA).~~

A.5. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Nigeria (host)	C-Quest Capital LLC (private entity)	No
Netherlands	C-Quest Capital LLC (private entity)	No
Sweden	Swedish Energy Agency	No

A.6. Public funding of PoA

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No public funding from Annex I parties to the United Nations Framework Convention on Climate Change (UNFCCC) are envisaged to be made available for the proposed SSC-PoA, or any CPA under the proposed SSC-PoA. If public funding from Annex I parties to the UNFCCC is provided, the CME shall confirm that the funding is not diversion of Official Development Assistance (ODA)[7].

SECTION B. Management system

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Description of the operational and management arrangements established by the coordinating/managing entity for the implementation of the SSC-PoA, including:

(a) Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;
A clear definition of roles and responsibilities of the parties involved in this SSC-POA has been given in Part II Section ~~A.1~~H.3.~~ ~~The CME shall have the competencies to check the features of potential CPAs and ensure that each CPA meets all requirements and eligibility criteria before inclusion in the SSC-PoA.

CME Competencies:
C-Quest Capital LLC (CQC)
CQC has been the leader in the development of Programme of Activities under the CDM, having developed the CFL lighting scheme - “Bachat Lamp Yojana” PoA (CDM Ref 3223) and implemented more than 4 CPAs under it (at the time of validation of this SSC-PoA).
CQC is currently the CME for five SSC-PoAs:

- POA 1: Improved Cookstoves Program in Zambia
- POA 2: Distribution of ONIL-stoves Mexico
- POA 3: Distribution of ONIL-stoves Guatemala
- POA 4: Distribution of Improved Cook Stoves in Sub-Saharan Africa: CME
- POA 5: Improved Cookstoves Program for Malawi and cross-border regions of Mozambique

CQC staff has over 20 years of experience with ICS, having been involved and leading key operations to provide funding through multiple instruments for improved cook stove distribution in different countries. These operations have proven successful and introduced consumers to the opportunity of ICS. CQC staff has established working relationship with major international stove

[7] Official development assistance (ODA) is defined in the *OECD Glossary of Statistical Terms* as follows: Flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element of at least 25 percent (using a fixed 10 percent rate of discount). By convention, ODA flows comprise contributions of donor government agencies, at all levels, to developing countries ("bilateral ODA") and to multilateral institutions. ODA receipts comprise disbursements by bilateral donors and multilateral institutions (*OECD Glossary of Statistical Terms*)

producers and have been involved in the development of registered methodologies and PDDs and SSC-POAs for ICS.

(b) Records of arrangements for training and capacity development for personnel;
Key training needs:

- ~~Baseline surveys: Perhaps the most important single variable in terms of quantifying CERs is the baseline fuel usage in households. The quality of the interviewing was key in achieving as accurate a baseline assessment as possible. For this reason, the CME, through HED Consultancy and ABH Associates, has established general guidance for interviewers to follow when conducting baseline fuel surveys in homes. This guidance outlines the questions and manner in which the interview should be conducted in order to get the most accurate estimate possible.~~

- Monitoring: Training, including that of field personnel, is needed to ensure monitoring activities are conducted effectively. This will include spot checking a random sample of homes with ICS to ensure the stoves are continuing to be used, as well as a random sample of homes selected for the stove efficiency tests (efficiency tests will be carried out by a third party or trained CPA Implementer/CME personnel using the Water Boiling Test). The procedures to complete this sampling are described in Part II Section ~~B~~ I.7.2 and meet ~~EB86 Annex 3~~ the confidence/precision requirements stated in 'Standard- Sampling and surveys for CDM project activities and programmes of activities'; version 08.

- ICS distribution: CPA Implementers shall provide evidence of their ability to train technicians on ICS assembly and distribution in accordance with the type of stove implemented under its CPA.

(c) Procedures for technical review of inclusion of CPAs.
The CME will undertake the following activities to ensure proper eligibility of the CPAs before they are uploaded for official inclusion into the SSC-PoA:

- CME will review each CPA document and methodically go through each and every eligibility/applicability criterion of the SSC-PoA to ensure the CPA meets each requirement with certainty. In cases where there is doubt, the CME will not upload the CPA document until the requirements are met to the CME's satisfaction.
- CME will review each of the ICS models that are proposed for distribution under each CPA. ~~If stove models have been used elsewhere, CME will attempt to get actual performance data in the field to ensure minimum criteria for the SSC-PoA are met, such as the 20% minimum thermal efficiency, and/or CME will review any WBT results to ensure they are in line with established protocols and have been conducted either by certified authorities/researchers or based on manufacturer specifications.~~
- CME will review database/registration procedures to ensure proper recording of the ICS data collection and management in line with the methodology and SSC-PoA eligibility criteria.
- CME will review all proposed CPA Implementer's monitoring procedures to ensure they conform with the Monitoring Plan in the SSC-PoA (as per Part II Section ~~B.7.2~~ I.7of the SSC-PoA-DD), including stove efficiency testing and procedures such as visual inspection and WBT test (efficiency of stove) to check that ICS are still in operation and at what efficiency.
- During implementation of the CPA, and as necessary, the CME personnel will visit each CPA region to ensure all procedures outlined in the SSC-PoA are being followed, particularly on stove registration and database updating.

(d) A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another SSC-PoA);

Each ICS in each SSC-CPA included in this SSC-PoA will be identified by a specific geographical location and customer name, as well as the unique serial number. Each serial number will be

associated with a specific CPA. The serial number will start with an identifier to be able to separate the stoves from this SSC-PoA with those of other potential SSC-PoAs. The identifier that will precede each serial number will be "CQC..." or three letters representing the stove model. Each stove's serial number will be entered into a database that will keep track of which stoves are in which CPAs. As each CPA will have a database that consist of name of the customer, address/ description of location, contact telephone number(s) and unique serial number for every stove so a project participant or verifier can easily determine that any stove identified in any household is affiliated with one – and only one – CPA. By simply referring to the database, a person can see in which CPA a particular stove is categorized.

Any households found to be using another project's stove will be removed from the project database. Emission reductions will be similarly adjusted if the sample reveals a certain number of stoves have been removed or counted in another SSC-PoA. The percentage of household found to be missing a stove or using another project's stove will be linearly applied across the database and exclude those users. In other words, if 1 out of 100 stoves sampled turned out to be missing or in another SSC-PoA, then the project participants would discount 1% for the entire population sampled, whether that population covered just one CPA or the entire SSC-PoA.

Double registrations of ICS will be flagged and removed from the database, so avoiding the risk of double counting within a single CPA, as well as across the SSC-PoA.

(e) Records and documentation control process for each CPA under the SSC-PoA:

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

Sales information and carbon asset ownership
Detailed sales information will be collected for each customer, either using electronic or paper-based means. On electronic means, the data will be collected by SMS (i.e. mobile phone 'short message service' text) or Information and Communication Technologies ('ICT' – such as PDAs). On paper-based means, a registration card will be provided to each stove customer with instructions on how to text registration information to a data management system. The SMS will include the name of the customer, address/ description of location, contact telephone number(s), unique serial number of the stove, retailer ID, and date of purchase. Alternatively, the customer may complete the registration card and return it to CQC for manual entry into the sales database. The SMS/ICT or completed registration card will also constitute an agreement that the household formerly used wood predominantly on a three-stone fire or traditional pot-support/ stove, and is willing to transfer carbon assets created by the ICS to CQC.
In case a replacement stove is being issued / sold to a customer already registered on the project database, a new registration will not be required. The replacement stove will be recorded in the project database in such a way that it is clear that the replaced stove ceases to be included in the CPA; and the replacement stove is associated with the customer's details as a new stove, and is included in the CPA as a new stove. The replacement stove will have a new serial number and will not take over the serial number from the stove that was replaced.

SMS/ICT data will be collated automatically. Written registration cards will be entered manually onto the same database.

Record Keeping
- Detailed records of trade and retail sales and purchase transactions will be captured and kept in paper and/ or electronic formats.
- Copies of all electronic records will be kept in both Nigeria and in the United States for a minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever is later.
- Paper records (where they are deemed required) will be kept at the CPA Implementer's offices, or another location designated by CQC in Nigeria for a minimum of two years.

Checks on record-keeping system

Getting accurate data in order to find the stoves at a later date will depend on capturing accurate address information. In Nigeria, in the locations where most end-users live, there are no street names or numbers. People use a general description for an address. By having the name, phone number, town, and general address description, the project will in most cases be able to find the actual exact location by visiting that area.

- The delivery manifest for each stove delivery to sellers will contain a list of stove serial numbers for each stove delivered.
- Where electronically submitted, once a given phone number has been used to submit information for a defined number of stoves, the software will block it from a predetermined
- number of future submissions. Stove sellers' phone numbers may be exempted from this by prior agreement.
- Project distribution staff will spot-check end-users to verify that information submitted was factual.

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

~~Paragraph 10 of EB54, Annex 13 'Guidelines on assessment of de bundling for SSC project activities' states that:~~
~~'If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a SSC-PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied, then that CPA of SSC-PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity.'~~

~~The AMS IIG threshold is a maximum energy saving of 180 GWhth/ year. The debundling rule does not apply to this SSC-PoA as the ICS (the independent subsystem) being distributed does not exceed 1% of the SSC threshold. Each ICS is in the order of magnitude of 0.01% of the SSC threshold.~~
In line with paragraphs 124 (m) and (n) of 'CDM project standard for programmes of activities'; version 02.0, "if the generic CPA consists solely of units that qualify as microscale CDM units as defined in the Methodological tool: Demonstration of additionality of microscale project activities" then conditions to ensure that CPAs that will be included meet the small-scale or microscale thresholds and remain within those thresholds throughout the crediting period of the CPAs is not required. Also, such CPAs need not carry out assessment of the debundling check.

As the generic CPA consists of microscale CDM units as demonstrated in Section C of the document, CPAs implemented under the PoA and consisting of microscale CDM units are exempted from demonstrating small scale threshold limit or conducting debundling check throughout their crediting period.

CPAs which do not qualify as consisting of microscale CDM units, shall have to adhere to small scale limit specified under paragraphs 124 (m) & (n) of CDM project standard for programmes of activities; version 02.0

~~This is calculated using the following formula illustrated using the small-scale energy savings threshold of 180GWh$_{th}$/year:~~

~~Annual Energy Saving of an ICS as per cent of SSC threshold~~
~~$= ((NCV_{biomass} * B_{y,savings})/180GWh_{th})*100$~~
~~$= NCV_{biomass} * (B_{old} * (1-(\eta_{old}/\eta_{new}))/180GWh_{th})*100$~~

~~Where:~~

~~$NCV_{biomass}$ - Net calorific value of the non-renewable biomass that is substituted (IPCC default for woodfuel, 0.015 TJ/tonne), calculated as ((0.015TJ/tonne)*(0.277777GWh/TJ[8])~~

~~$B_{y,savings}$ - Total biomass that is saved in tonnes in one year (y)~~

~~B_{old} - Baseline biomass fuel consumption per appliance (i.e. in the absence of the project activity)~~

~~η_{new} - Efficiency of the ICS – 0.90 (using a very high efficiency results in a higher value of annual energy saving of ICS (what can be considered as conservative if referring to the debundling criteria)~~

~~η_{old} - Efficiency of the baseline stove – 0.10~~

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

CPA Implementers have the operational responsibility for implementing and monitoring the CPAs under this SSC-PoA. The CME will have legal contracts in place with CPA Implementers and, as appropriate, with entities assisting with the implementation of the CPA. These legal contracts shall clearly state that the implementation of CPA activities are subscribed to this SSC-PoA.

(f) Measures for continuous improvements of the SSC-PoA management system.
The CME will undertake an annual review of the overall SSC-PoA management system, including identifying any problems with stove distribution, stove use once in the homes, monitoring continued stove use and overall database maintenance. This review will ensure that best practices are maintained through the lifetime of the SSC-PoA.

SECTION C. Demonstration of additionality of PoA

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The proposed SSC-PoA is a voluntary coordinated action
There are no mandatory requirements in Nigeria stipulating the use of energy efficient thermal appliances. In addition, the SSC-PoA requires individual households to take voluntary action to participate in the project activities.

If the SSC-PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the SSC-PoA;
Significant capital is required to invest in a programme which could match the achievements of this proposed SSC-PoA, including for import of technologies, developing the brand, widespread marketing, and establishing a distribution and retail network. There is no precedent for large-scale private or public-sector involvement in ICS promotion and distribution in Nigeria. CQC has been unable to find investors willing to provide the level of capital necessary to implement such a program without the hard-currency revenues from selling CERs. CQC's team of investors, which have key roles in providing both debt and equity in the ICS initiative, have all provided letters stating that they would not consider this kind of investment unless this SSC-PoA is CDM registered and eligible to sell CERs. And CQC has been unable to find any other investors in this project, given the risks of doing this kind of project in Nigeria.

~~8 This is the conversion factor from terajoules to kilowatt hour, ie. 1TJ = 277777.77777778 kWh or 0.277777 GWh~~

The statements from these investors are critical because they will be providing the capital necessary to purchase, import, market and distribute thousands of cooking stoves in Nigeria. Without this capital, the project simply could not move forward. Although there are tangible benefits for consumers in the form of lower wood costs, the project generates little income for those who are financing the project – the sale of the CERs is the only way in which any investor could be reasonably assured of making a return on such a high-risk project.

About 80% of the population of Nigeria use wood for domestic cooking[9]. There is a very low prevalence of ICS (none were identified in over 250 households randomly selected in the baseline), and the majority of people use open fires with three-stones to support pots, or simple locally-fabricated metal pot supports which offer little or no improvement over the three-stone fire as they do not have the basic characteristics of an improved stove. Only two NGO/private-sector domestic ICS initiative in Nigeria has been identified (based in Kaduna and Kano States); ICS are not available in public markets; and the concept of ICS is not widely understood. Together, this lack of availability and awareness presents a significant barrier to introducing ICS in Nigeria. Carbon finance will enable significant investment in awareness raising, education, promotion and demonstration to create consumer awareness and confidence in these products. Such investment is not forthcoming from any other sector.

Unlike in many other countries across Africa and the Globe, there is little history of improved cooking stove initiatives in Nigeria. As a result, apart from crude, artisanal stoves available in markets which are likely to offer negligible improvements in efficiency and performance, and which have a short life, few alternatives exist. Therefore, many users are unaware of the existence of efficient cooking stoves or their potential benefits. When asked why individuals used traditional cooking stoves, 50% said it was because there was no alternative, and others cited low costs. Sixty percent of people said they were not considering purchasing an ICS; more than 75% said this is because they have not heard of ICS; because ICS were not available, or because ICS were too expensive.

Without significant investment in product marketing and awareness-raising of the potential fuel savings and health and safety benefits of ICS, widespread uptake of ICS in Nigeria would be highly unlikely. In addition, without marketing and awareness-raising, willingness to pay would remain below the cost price of ICS. Marketing and awareness-raising at this scale is costly, and also requires specific skill sets which neither the government of Nigeria nor private-sector bodies generally fund or have capacity to deliver. Therefore, lack of awareness constitutes a significant barrier, and carbon finance would enable the project to be delivered.

~~As per Annex 27 of the 68th meeting of the CDM Executive Board, GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES (version 9), paragraph 2(c), projects are considered additional if project activities are solely comprised of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale thresholds.~~

~~Annex 21 of EB 61 established 60GWh per year as the SSC threshold for type II projects. The conversion from 60 GWHe to 180 GWHth per year was approved in a clarification by the small-scale working group (SSC_233). Footnote 1 of Annex 27 of EB 68 clarifies that the size of each unit (ICS) has to be below 3000 MWh of energy saving per year, equivalent to 9000 MWhth/yr. As all ICS are likely to be far below this threshold the PoA is additional, this will be confirmed for each CPA in eligibility criterion 3.~~

~~Additionality for the CPAs implemented under the present PoA shall be demonstrated through Figure 1 in Appendix to methodological tool "Demonstration of additionality of small-scale project activities"; version 13.0.~~

[9] National Bureau of Statistics. 2009. Social Statistics in Nigeria

~~According to this figure, for type II projects (energy efficiency) the aggregate CPA size should be less than or equal to the small- scale threshold (180 GWh_{th}/yr). If the aggregate CPA size is not less than the small- scale threshold, then the CPAs have to demonstrate that-~~

~~a) They are comprised of units which are less than or equal to microscale threshold (60 GWh_{th}/yr)~~
~~b) Each unit should result in energy saving of less than or equal to 1.8 GWh_{th}/yr (600 MWhe/yr) and end users are household/communities or SMEs,~~

~~If both conditions (a) and (b) are fulfilled, then such CPAs are additional.~~

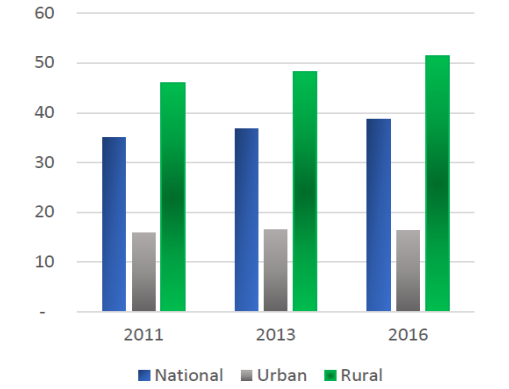
~~For the present PoA, the generic CPA consists solely of 'microscale CDM units' as defined by Methodological tool "Demonstration of additionality of microscale project activities"; version 09.0. hence condition (a) is fulfilled. Therefore, in order to demonstrate additionality, the CPAs are required to show applicability to requirements of condition (b) that is- it shall consist of distributed units where each unit saves less than equal to 1.8 GWh_{th} (600 MWhe) energy per year and end users are households/communities.~~

Additionality of the CPAs under the PoA is demonstrated through Methodological Tool 19 Demonstration of additionality of micro-scale project activities Version 09.0 as demonstrated below

Nigeria is Africa's largest economy and one of the fastest growing in the world, yet, more than half of the Nigerian population grapple with extreme poverty. The paradox of growth in Nigeria is that as the country gets richer, only a few benefit, and the majority continue to suffer from poverty and deprivation.

Poverty and inequality in Nigeria have a strong spatial dimension and remains largely a rural phenomenon[10].

Figure 1: People living in Poverty
in percent of population in strata



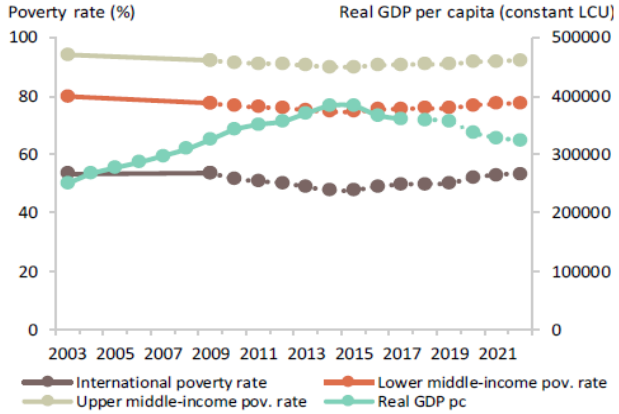
Source: World Bank staff estimates based on GHS.

According to a recently published World Bank document[11], Nigeria's vulnerability to global economic disruption caused by COVID-19, aggravated by declining oil prices, will increase the

[10] http://documents.worldbank.org/curated/en/636531549879664295/pdf/NIGERIA-Poverty-Briefing-Note.pdf

[11] http://pubdocs.worldbank.org/en/848651492188167743/mpo-nga.pdf

share of the population vulnerable to falling into poverty due to increase in unemployment and underemployment.



Source: World Bank.
Notes: see table 2.

The document further describes the actual and projected poverty rates in Nigeria. It is clear that the percentage of population living below International poverty line ($1.9) is projected to increase from 50.1% in 2019 to 53.4% in 2022.

International poverty rate ($1.9 in 2011 PPP)[a,b]	49.7	49.9	50.1	52.0	52.9	53.4
Lower middle-income poverty rate ($3.2 in 2011 PPP)[a,b]	75.7	75.8	75.9	76.9	77.4	77.6
Upper middle-income poverty rate ($5.5 in 2011 PPP)[a,b]	90.8	90.9	90.9	91.6	92.0	92.1

Table 2

According to Nigeria- Sustainable Development Goals (SDG) indicators baseline report (2016), 62.6% of population was under the national poverty line in the assessment year. However, a more recent report by National Bureau of Statistics on Poverty and Inequality in Nigeria -2019, pegs the proportion of rural population living below national poverty line (NPL) at 52.1% (page 5) and going by the World Bank document (referenced above) this figure is only going to increase in the coming years in view of the current economic downturn triggered by declining oil prices and outbreak of Covid-19 Pandemic.

The report gives a brief idea about the way NPL is calculated- by adding food poverty line and cost of non-food basic needs which results in a value equal to 137,430 Naira per person per year. The implication of this value is as follows: the individuals living in households whose per capita annual consumption expenditures is below 137,430 Naira are considered poor by national standards (paragraph 14, page 5).

Thus, in accordance with paragraph 10 (b) (iii) of Methodological tool: Demonstration of additionality of microscale project activities Version 09.0; rural regions of Nigeria can qualify as SUZ as 52% of the population in these regions earn less than the national poverty line which is 137,430 Naira.

Therefore, according to paragraphs 12, 14 and 15 of Tool 19, version 09 and the description above, CPAs which qualify the following conditions are additional-

a. Consist of distributed units of less than equal to 20GWh (60GWh$_{th}$) of annual energy saving
b. Implemented in rural[12] regions which have been identified as SUZ areas of Nigeria.

For CPAs which do not qualify the above conditions, additionality shall be demonstrated in line with Figure 2 of the Tool -Demonstration of additionality of microscale project activities, version 09.0.

[12] Compliance with this requirement (rural area) shall be demonstrated in specific CPA DD.

SECTION D. Start date and duration of PoA

D.1. Start date of PoA

>>
07/11/2012

D.2. Duration of PoA

>>
28 years 00 months

SECTION E. Environmental impacts

E.1. Level at which environmental impacts analysis is undertaken

>>
The CPA boundaries are not defined geographically but by individual sales location. Moreover, the technologies distributed through each SSC-CPA present similar positive environmental impacts wherever they are applied and no anticipated negative impacts. Therefore, an SSC-PoA-level Environmental Analysis is deemed most appropriate.

An EIA is not required as a part of this program, as illustrated by the following website:

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

EIA Decree states that an environmental assessment of project shall not be required when:

~~(c)~~ *"the project is to be carried out in response to circumstances that, in the opinion of the Agency, the project is in the interest of public health or safety".*

As stated in the LOA, the government believes that this project will improve health conditions and therefore complies with Option ~~c~~ above.

In addition, there is language which states that when the federal government exercises its duty – specifically issuing an LOA – and there is no further duty to be undertaken (as is the case with a cooking stove project), that an EIA is not required:

"For greater certainty, where the Federal, State or Local Government exercises power or performs a duty or function for the purpose of enabling projects to be carried out an environmental assessment may not be required if -

(a) the project has been identified at the time the power is exercised or the duty or function is performed; and

(b) the Federal, State, or Local Government has no power to exercise any duly or perform functions in relation to the projects after they have been identified."

E.2. Analysis of environmental impacts

>>
The Stoves being disseminated in this programme are expected to present a substantially lower risk to the local and global environment, and also result in real socio-economic and health benefits to users.

In particular, the activities will result in the following positive environmental impacts:

- Reduced wood fuel consumption, resulting in lower greenhouse gas emissions~~–~~ as well as improved local and household air quality;

- Reduced pressure on forest resources through reduced fuelwood demand;
- Reduced transportation of fuelwood within Nigeria through reduced fuelwood demand. There is considerable evidence from literature[13] and baseline studies that fire–wood is transported significant distances (often many hundred kilometres) to meet demand, particularly in cities. A reduction in demand for firewood, even if it did not shift supplies closer to areas of demand, would result in a reduction in would fuel transported around Nigeria;

Trans-boundary impacts
Emissions calculations are based on the performance of individual stoves within each SSC-CPA, irrespective of where they are manufactured.

E.3. Environmental impact assessment

>> The government of the Federal Republic of Nigeria does not require an environmental impact assessment to be conducted for a typical CPA under this SSC-PoA. In view of this, as well as the conclusion of E1 and E2 that no negative environmental impacts are anticipated, environmental impacts will not be analysed for the SSC-PoA or for any CPAs included in the SSC-PoA.

SECTION F. Local stakeholder consultation

F.1. Level at which local stakeholder consultation is undertaken

>>
The CPA boundaries are not defined geographically but by individual sales location and may extend across the SSC-PoA project area. Therefore, an SSC-PoA-level Stakeholder Consultation is deemed most appropriate, covering the whole project area.

F.2. Modalities for local stakeholder consultation

>>
As per the guidelines (3/CMP.1, Annex, paragraph 1(e)), Stakeholders are the public, including individuals, groups or communities affected, or likely to be affected, by the proposed clean development mechanism project activity. Stakeholder comments have been invited with respect to this SSC-PoA through formal Stakeholder Consultations held on 19 September 2012 in Kaduna[14] and 23 May 2011 in Kano[15].The Kaduna stakeholder consultation was advertised in the local paper and was attended by mostly prospective ICS consumers and distributors of the ICS. For the stakeholder consultation in Kano, a letter of invitation was sent to 60 participants from academia, the media, various Non-Governmental Organizations, Traditional Institutions, hotel managements and restaurants operators, the Firewood Sellers Association, the Peasant Farmers Association, and other artisans association among others. Advertisements were also published in local/national media.

Stakeholders from all over Nigeria were invited for the stakeholders meeting that was held on 23rd May 2011 in Kano vide advertisements in national/local newspapers; Daily Trust and Daily Triumph. Moreover, these advertisements were published consecutively for two days (19th & 20th

[13] Maconachie, R, A Tanko, and M Zakariya. 2009. Descending the energy ladder? Oil price shocks and domestic fuel choices in Kano, Nigeria. *Land Use Policy*, no. 26.

[14] A local stakeholder consultation was held in Kaduna, and significant representation from prospective consumers and distributers of ICS were present.

[15] A broader stakeholder consultation was initially held in Kano for security reasons as Kano was a safer option and would allow for greater attendance of those who would need to travel from outside the state.

May 2011) to attract maximum attention of the stakeholders. In the advertisements it was clearly stated that under the PoA the CME intends to implement 2 million improved cooking stoves in Nigerian households in a span of 7 years comprising the first PoA period. In addition to invitation for physical presence, the stakeholders were also given the option of conveying their comments or suggestions via e-mail. Furthermore, through these ads, the stakeholders were also encouraged to contact PP designate to seek more information on the project. Also, vital information about the project was shared in the stakeholders meet, during which it was explained how more people were dying in Nigeria due to indoor air pollution related health issues than HIV and malaria and unabated collection of fuel wood was leading to large scale deforestation and desertification in the country.

In the month of September, the following year that is 2012, stakeholders were again given a chance to voice their opinion on the project through second stakeholders meeting held in Kaduna. This meeting also just like the previous one, was advertised in National newspaper – Daily Trust. Personal invitations and e-mails were also sent to identified stakeholders for this meeting. Like the previous meeting, stakeholders were encouraged to submit their concerns, comments or queries through e-mail.

Both meetings were chaired by a project representative. Presentations were given outlining the project, as well as the wider issues of wood fuel use for cooking and improved stoves in general. The meetings provided opportunities for attendees to request clarifications, raise any concerns, and express support for the project, as well as submit written comments. All proceedings were documented.
Further consultations were undertaken during baseline assessment, as follows:

1. ICS cooking tests with 5 local women over 2 days
2. Focus group discussions
3. Key-informant interviews held with NGOs, public-sector bodies and Government, including:

a. Desert and Desertification Unit (DDU) (12 Jan 2011): Assistant Director, Chief Forestry Officer and Scientific Officer
b. Energy Commission of Nigeria (31 Jan ~~2010~~2011): Director, Deputy Director, Director Research
c. International Centre for Energy, Environment & Development (ICEED) (13 Jan 2011): Executive Director
d. Women Environmental Programme (WEP) (10 Jan 2011): Executive Director.

Thus in line with paragraph 60 of the CDM project standard for programme of activities, version 02 It can be concluded that the CME made all efforts to reach out to stakeholders such as end users, government bodies, media persons, NGOs etc in a transparent manner and provided them the opportunity to comment on the project in person or via mail. Also, the effect of PoA in terms of reduced deforestation, improvement in quality of life of women, employment opportunities that were expected to arise as a result of demand of stove parts etc which were discussed during stakeholders meeting or which was stated in the advertisements, was in the context of entire Nigeria as the PoA was perceived to bring about positive changes in the country as whole.

F.3. Summary of comments received

>>

Summary of comments arising from surveys and key informant consultation

1. Will the stove be manufactured in Nigeria to keep costs down and provide employment opportunities?
    a. Stove components will be imported in order to benefit from low-cost, consistent high quality; assembly will be undertaken in Nigeria, which will provide employment opportunities.
2. What measures are in place to ensure sustainability and scale of this project, in view of difficulties faced in the past?
    a. Unlike some previous initiatives, this program will leverage a combination of high-quality, high-performance durable devices; widespread promotion and dissemination channels; and subsidised prices enabling access across society.

3. Can the stoves burn animal dung?
    a. Wood is the most commonly-used fuel within this project area, and the stoves being introduced are specifically designed to improve its combustion. They are not suitable for use with animal manure or all agricultural residues.
4. How will the project deal with imitations of stoves?
    a. All stoves registered under this program will bear a unique serial number, linked to a database. The stoves also use certain highly-specialised materials which would be very difficult to replicate or even imitate.
5. Have academics in Nigeria been involved and consulted in the process of project design?
    a. From the outset academics and other key informants across sectors have been consulted and involved with data collection.
6. (From a user of an ICS) The stoves are convenient, fast, easy-to-use and save money – he reported halving his expenditure on wood fuel.

Comments arising from surveys and key informant consultation

1. Women who tested stoves
    - □ Stoves were found to visibly save considerable fuel, and were described as easy to use;
    - □ 100% wished to purchase an ICS after trying it;
    - □ No one reported any need to change the way food was cooked.

2. Men who participated in focus group discussions
    - □ Some of the men were initially reluctant to pay for an ICS. However, when the economics of the fuel-efficient stove were explained, participants became willing to pay for ICS as they realised the potential savings that could be realised. However, their willingness and ability to pay was still relatively low, and not high enough to meet the full unsubsidised cost of an imported ICS.

3. Key-informant interviews.
   All key informants consulted were in support of these activities. Specific comments underlining the additionality of this SSC-PoA and need and support for its activities included:
    - □ Forest cover in Nigeria is fast being depleted, and fuelwood extraction is a major factor and needs to be addressed (DDU).
    - □ Alternatives to woodfuel are not widely available, while efficient wood stoves remain unaffordable to the majority, and prices of wood itself continued to rise. Any initiatives to increase usage of improved stoves across Nigeria are very welcome (Energy Commission of Nigeria).
    - □ Indoor air pollution from cooking presents a major public health issue for Nigeria, but there are no certified improved cooking stoves on the market – the majority are just made from scrap metal. There is a trend towards woodfuel use in Nigeria, mainly driven by affordability of alternative stove and fuels (ICEED).
    - □ Deforestation and indoor air pollution issues need to be addressed, and affordable improved cooking stoves are required in Nigeria.

F.4. Consideration of comments received

>>

Comments arising from stakeholder consultations

All clarifications requested during the stakeholder consultation were addressed to the satisfaction of attendees. No unresolved issues were raised, nor were any misgivings cited. All other comments received were positive in relation to the planned activities. No follow up action was required in respect of the comments received.

SECTION G. Approval and authorization

>>

A Letter of Approval has been provided by the Designated National Authority of Nigeria.

PART II. Generic component project activity (CPA)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
Distribution of fuel-efficient improved cooking stoves in Nigeria- CPA XXX

H.2. Reference number of generic CPA

>>
XXX

H.3. Purpose and general description of generic CPA

>>
Each SSC-CPA will involve the promotion and sale of affordable improved cooking stoves (ICS) to individual households, defined by a detailed sales record.

Implementation & management
CQC will manage and coordinate the promotion, distribution and sale of the ICS using a 3-channel distribution system.

a. The first channel will leverage existing local, experienced commercial distributors, and focus primarily on peri-urban markets. Each of the distributors will have their own established network of retailers.
b. A second channel will primarily utilise smaller, local retailers and community organisations including churches, mosques and NGOs to access more rural markets. Religious bodies have been used in the past to promote and distribute products in Nigeria.
c. A third channel will market directly to consumers through direct sales at local markets days and other large community events.

CQC will manage and coordinate activities of the partners, and also provide all necessary marketing and promotion assistants to the businesses. CQC will also coordinate the monitoring of the programme activities.

Responsibilities of Operational and Management Entity and CPA Implementer

- **C-Quest Capital (CQC)** – Coordinating and Managing Entity
  - Review all CPAs to confirm that all eligibility requirements are met before a CPA is proposed for inclusion;
  - Manage the inclusion of new CPAs with DOE
  - Maintain copies of the CPAs database and back-up records necessary to verify stoves sold within each CPA and the SSC-PoA overall;
  - Provide overall coordination of ICS distribution across the geographical boundary of the SSC-PoA;
  - Oversee day-to-day operation of the SSC-POA;
  - Coordinate with a DOE to verify emissions reductions from CPAs; and
  - Communicate in all matters with the UNFCCC CDM Executive Board

- **CPA Implementer**
  - Coordinate and manage the market promotion necessary for successful distribution;
  - Coordinate and manage the implementation of the monitoring plan;
  - Manage the process of stove selection, stove testing and stove use surveys in the field on designs agreed with CME;

- Develop and undertake stove distribution and after sales service systems;
- Develop and maintain a stove tracking and monitoring and reporting system with a high level of data integrity;
- Maintain an accurate database of stove location for verification and issuance of carbon credits under a design agreed with CME;
- Keep all records necessary to verify sold stoves within each CPA;
- Implement and oversee day-to-day operation of the Programme, including ensuring users of the stoves are aware of how they should be used;
- Track stoves to end users and verify use;
- Facilitate the field work of commissioned DOEs for inclusion and verification services;
- Supervise and provide training to local personnel for, monitoring and stoves distribution;
  - Organize training sessions
  - Distribute training materials

No training of manufacturers will be required for stoves that are imported as finished units. Where CPAs include stoves manufactured or assembled locally, CQC will arrange for appropriate training to ensure consistent high quality as required and in conjunction with the stove manufacturer.

Location & scale

CPAs will be defined as the sum of fixed locations of stoves sold to consumers using ICS within ~~either Kaduna and/or Kano States~~, Nigeria, based on a detailed sales record. The sum of the location of these households will define the spatial boundary of the SSC CPA. For CPAs consisting of microscale CDM units, each ICS distributed under the CPA will adhere to the micro-scale limit with respect to paragraph 124 (m) of Project standard for programmes of activities; version 02 hence demonstration of adherence of CPA to small scale limit is not required.

For CPAs which do not qualify as consisting of microscale CDM units as defined under paragraphs 12 (a) or (b) of methodological Tool 19; version 09,

~~Each CPA will define~~ a limit to the number of stoves based on the specific technology and context, such that the energy savings of each CPA does not exceed the SSC limit of 180 ~~GWHth~~GWh_{th}/ year is required to be demonstrated.

~~The maximum number of fully functional ICS in any one CPA will be dependent on the biomass saved by each ICS ($B_{y,saving}$) in one year and shall be calculated in the following manner~~

Maximum ICS per CPA[16] = 180 GWhth/($NCV_{biomass}$*$B_{y,savings}$)

Where:

$NCV_{biomass}$	Net calorific value of the non-renewable biomass that is substituted (IPCC default for woodfuel, 0.015 TJ/tonne) – which can be calculated as (0.015TJ/tonne)*(0.277777GWh/TJ)
$B_{y,savings}$	Total biomass that is saved in tonnes in one year (*y*)

Destruction of traditional stoves

The number of cooks reverting to cooking on three-stone fires and traditional stoves may be considered negligible for a number of reasons, as follows.

- 100% of households using the ICS during a pilot in March 2010 wished to purchase the ICS at the end of the pilot and said that they would use the ICS in the future. They were motivated by fuel savings, reduced smoke in the home and time savings.

[16] For CPAs which do not consist of microscale CDM units as defined under paragraph 12 (a) or (b) of Tool 19

- Stoves, fuels and diets change very little during the year[17] so the impacts of the seasons on usage may also be considered negligible.
- Surveys reveal that the majority of Nigerians purchase firewood so have an incentive to consume less wood and are aware of the fuel savings realised by ICS.

Any incidents of reverting to traditional stoves would be flagged by the ongoing spot checks and annual monitoring.

A switch to fossil fuels may also be discounted, as there is documented preference for firewood[18] even when fossil fuel alternatives are available and affordable, and the last decade has seen a trend away from petroleum-based fuels to wood use.

H.4. Technologies/measures

>>

The activities under the proposed SSC-PoA will promote improved cooking stoves that result in substantially reduced fuel consumption and emissions for conducting cooking and water heating tasks in homes. The ICS used in this SSC-PoA have characteristics that improve the efficiency of combustion and thermal transfer to the pot compared with a traditional stove or three-stone fire. Most do this by incorporating a 'rocket elbow'; a highly-insulated combustion chamber which provides a conducive environment for clean and efficient combustion of wood. ICS substantially reduce woodfuel consumption compared with a three-stone fire. Efficiency of the ICS shall be established by a national standards body or an appropriate certifying agent recognized by it, or alternatively manufacturers' specification shall be used.

Specific stoves types will be described for each SSC-CPA.

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

>>

AMS-II.G. Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass. Version ~~03~~11.

I.2. Applicability of methodologies and standardized baselines

>>

~~NOTE: In the case of CPAs which individually do not exceed the SSC threshold, SSC methodologies may be used once they have first been reviewed and, as needed, revised to account for leakage in the context of a SSC-CPA.~~

Methodology

The AMS-II.G Version ~~03~~ 11 methodology pertains to 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 biomass fired cooking stoves or ovens or dryers and / or improvement of energy efficiency of existing biomass fired cooking stoves or ovens or dryers.

Further, it requires ~~that activities do not save the non-renewable biomass accounted for in other projects;~~ that non-renewable biomass has been in use since 1989~~.; that the project is defined by physical geographical boundary.~~

~~17 Nigeria National Follow-up Survey. HED Consulting Ltd. June 2011.~~

~~18 Ibid.~~

SSC-PoA applicability
79.6% of Nigerians are dependent on woodfuel for domestic cooking[19]. The technologies employed in this SSC-PoA are improved cooking stoves (ICS) which substantially reduce fuel consumption through improved combustion and thermal-transfer efficiency.

The use of non-renewable biomass is prevalent; there is significant evidence of widespread long-term deforestation across Nigeria; of a lack of effectively protected forested areas; of increasing price of fuelwood; and of increasing distance of transportation of fuelwood (often of many hundreds of kilometres). See Appendix 3 for details of the NRB assessment.

Avoidance of saving non-renewable biomass accounted for in other projects
Two other improved cooking stoves carbon finance projects are registered within the project boundary of this SSC-PoA. When a new stove is registered by a customer, they will be required to confirm that they previously used a three-stone fire and/ or traditional stove, thus ensuring that no households are enrolled which already own an improved stove registered under a different project. Registration data collected will be verified by spot-checks (see Monitoring).

Evidence that the non-renewable biomass has been in use since 1989
Non-renewable biomass has been used since 31 December 1989 ~~in Kaduna and Kano States, which is located in the center of the Guinea Savannah region,~~ in Nigeria. Evidence for this is presented below:

According to a study quoted by FAO[20], in 1994 demand for fuelwood across Nigeria outstripped supply, as summarised in the table below.

Comparison of production and demand of fuelwood in Nigeria in 1994. ('000m^3) (FAO 2003).

Ecological zones		
A. Production	Guinea Savannah	7,861
	Sudan Savannah	3,163
	High Forest	68,706
	Total production	**79,730**
B. Demand	Guinea Savannah	22,464
	Sudan Savannah	16,054
	High Forest	33,361
	Total demand	**71,879**
Summary	**Net deficit (B – A)**	**-7,851**

The Forest Resources Assessment 2005 (FAO[21]) indicates that total forest resources declined by 36% from 1977 to 1994, as summarised in the following table.

Comparison of forested areas across Nigeria in 1977 and 1994. ('000 Ha)

	1977	**1994**

[19] National Bureau of Statistics. 2009. Social Statistics in Nigeria. Table 2.9.

~~[22] 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 tCO2/TJ for Kerosene and 63.0 tCO_2/TJ for Liquefied Petroleum Gas (LPG).~~

Dominantly Trees/Woodlands/Shrubs	15 292	8 252
Disturbed Forest	1 473	1 925
Undisturbed Forest	2 623	1 228
Mangrove Forest	1 010	1 012
Montane Forest	683	685
Riparian Forest	748	533
Forest Plantation	101	159
Teak/Gmelina Plantation	63	117
Agricultural Tree Crop Plantation	84	166
Total	**22,077**	**14,077**

In view of the combined evidence of declining forested areas in 1977, with high NRB in 1994, it may be deduced that the majority of wood_fuel used across Nigeria in 1989 was from non-renewable sources.

AMS II. G Requirement	SSC-CPA Compliance Justification
The methodology is applicable to the introduction of single pot or multi pot portable or in-situ cookstoves with rated efficiency of at least 20 per cent.	Cookstoves distributed under the PoA shall have minimum efficiency of 20% as determined in accordance with 'Data/parameter Table 12' of the applied methodology.
The aggregate energy savings of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input.	CPAs consisting solely of microscale CDM units as defined by Tool 19, the energy saving of a single ICS shall not exceed the microscale threshold for energy saving per year. For CPAs which do not qualify as consisting of microscale CDM units as defined under paragraphs 12 (a) or (b) of methodological Tool 19, the aggregate energy savings in any year throughout the crediting period shall not exceed the small- scale threshold of 180 GWh_{th}/year.
Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	As demonstrated above, non-renewal biomass has been used in the project region since 31st December 1989.
For cases where the biomass is sourced from renewable sources, the project participants should use a corresponding Type I methodology.	This criterion is not applicable.
If the project device requires a specific fuel for this device (e.g. briquettes, pellets, woodchips), the consumption of the fuel should be monitored during the crediting period.	This criterion is not applicable.
The CDM-PoA-DD/CPA-DD shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo).	Each ICS under the PoA shall be identified through an alpha numeric nomenclature to be fixed to the ICS or in form of registration card to be given to the beneficiary. Specific CPA DDs to include explanation on proposed method of distribution of project devices including method to avoid double counting.
The CDM-PoA-DD/CPA-DD shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or	The stove manufacturers, wholesale providers, end users shall sign an undertaking stating clearly that the CME or an entity authorized by it shall be the sole owner of the CERs arising from the project.

others claim credit for emission reductions from the project devices.	

I.3. Application of multiple methodologies

>>
Not Applicable

I.4. Project boundary, sources and greenhouse gases (GHGs)

>>
As per the applied methodology AMS.II.G ver. ~~3~~11, paragraph ~~3~~16:"The project boundary is the physical, geographical site of the efficient ~~systems using~~devices that utilize biomass." The geographical area within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA ~~will be implemented~~ is ~~either Kaduna and/or Kano States,~~ the Republic of Nigeria. The assessment of sources and gases included in the SSC-CPA boundary is given below.

Source		GHG	Included?	Justification/Explanation
Baseline	Combustion of non-renewable firewood for cooking, Emission Factor for combustion of fossil fuels for cooking	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions. Exclusion is conservative assumption.
		N_2O	No	Minor source of emissions. Exclusion is conservative assumption.
Project activity	Combustion of non-renewable firewood for cooking, Emission Factor for combustion of fossil fuels for cooking	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions. Exclusion is conservative assumption.
		N_2O	No	Minor source of emissions. Exclusion is conservative assumption.

I.5. Establishment and description of baseline scenario

>>
According to the methodology, it is assumed that in the absence of the project activity, the baseline scenario would be "the projected use of fossil fuels to meet similar thermal energy needs as those provided by the project devices".~~the use of fossil fuels for meeting similar thermal energy needs~~. ~~In this particular project, the baseline is the avoidance of non-renewable biomass, which has a higher emissions factor than the AMS II.G default emissions factor of 81.6 tCO_2/TJ[22], and is therefore conservative.~~

~~[22] 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 tCO2/TJ for Kerosene and 63.0 tCO_2/TJ for Liquefied Petroleum Gas (LPG).~~

~~Further details on the baseline scenario and baseline survey results are provided in Appendix 4.~~
Application of Tool 11, for 'Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period' version 3.0.1

In line with paragraph 288 and 289 of CDM project standard for programmes of activities; version 02.0; modalities to calculate GHG emission reductions or net anthropogenic GHG removals that result from the baseline scenario has been reassessed in accordance with existing national and/or sectoral policies of Nigeria as well as the latest version of applied methodology.

~~Furthermore, data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the PoA period and which are no longer valid have been updated according to paragraph 291, CDM project standard for programmes of activities; version 02.0~~

Assessment of the validity of the data and parameters as per Tool 11

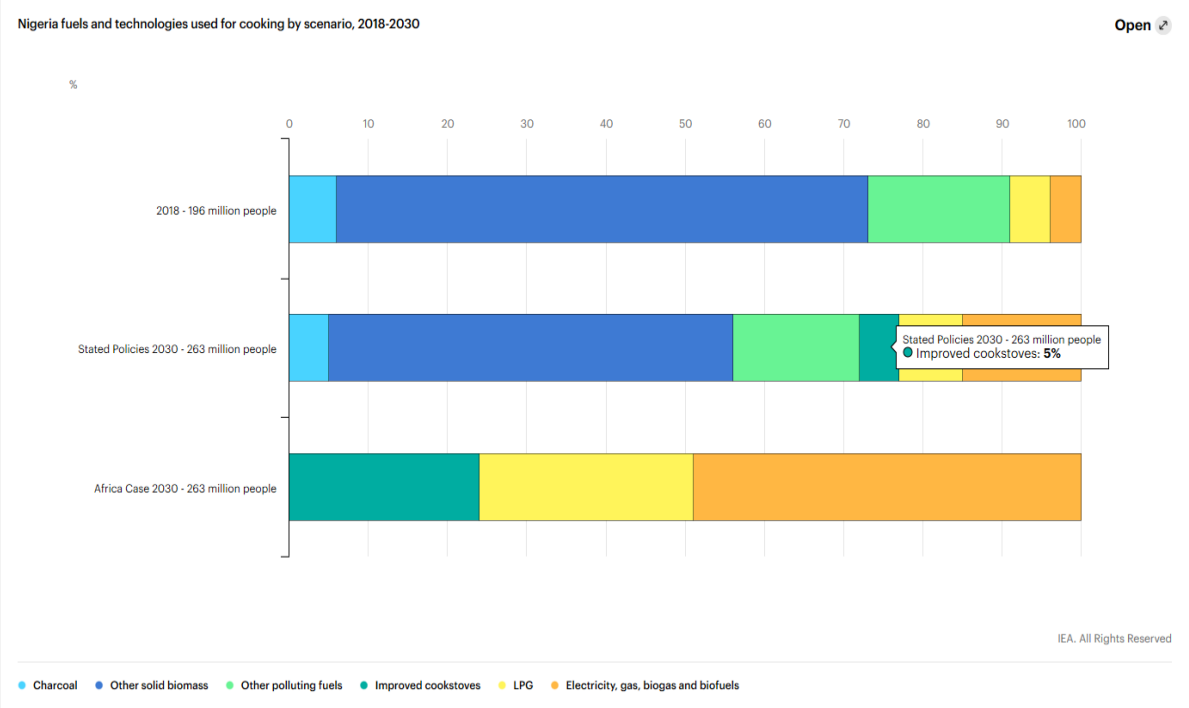
Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The current baseline that is projected use of fossil fuels to meet similar thermal energy needs as those provided by the project devices" is in compliance with the relevant national and sectoral policies of Nigeria.

In an attempt to address the health issues and reduce the pressure on biomass resources, the government of Nigeria introduced policies to encourage the use of efficient clean cooking devices. The National Renewable Energy and Energy Efficiency Policy[23] (2015) and The National Energy Policy, published in 2003, both emphasise the use of efficient cookstoves for household cooking. According to these policies, the government expects to provide clean cooking technologies to 5% of the population by 2030 while acknowledging the fact that solid biomass will continue to be the most preferred fuel for cooking. When this is compared to the current situation, in 2018 more than 70% of the population in Nigeria was dependant on solid biomass along with charcoal for meeting their cooking energy needs (IEA[24]).

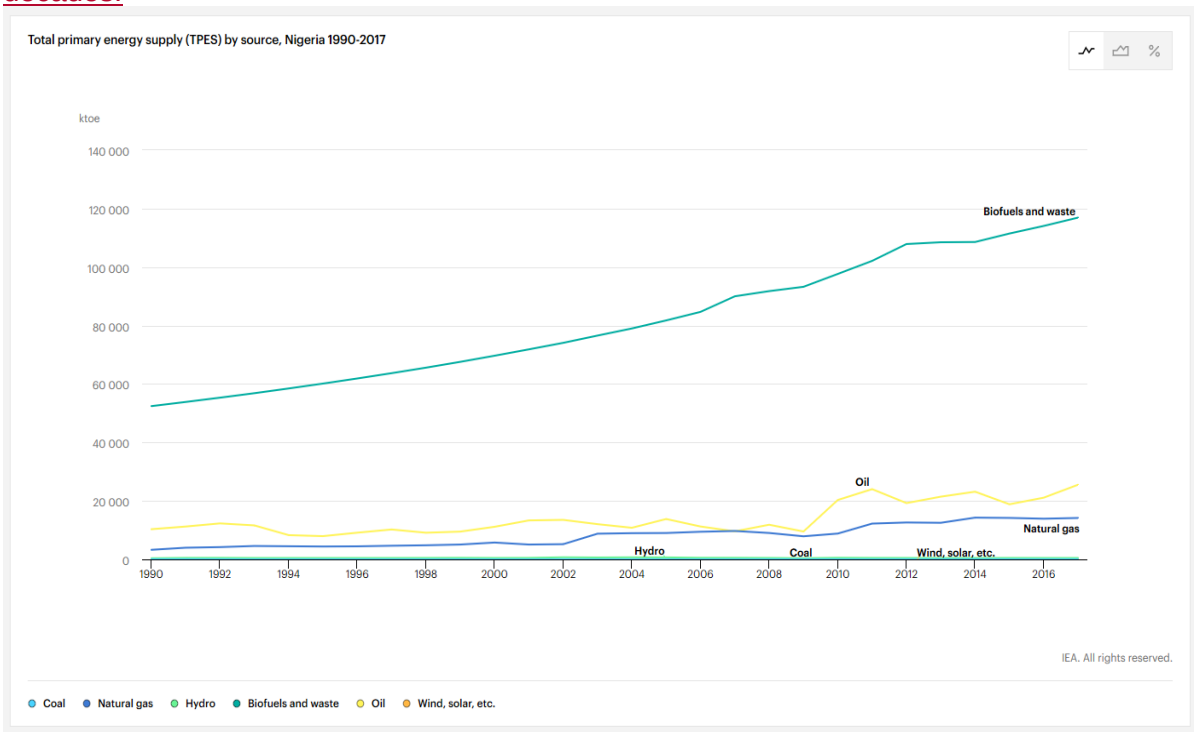
[23] http://www.power.gov.ng/download/NREEE%20POLICY%202015-%20FEC%20APPROVED%20COPY.pdf

[24] https://www.iea.org/articles/nigeria-energy-outlook



Step 1.2: Assess the impact of circumstances

Nigeria relies heavily on solid biomass for meeting its energy demand related to cooking, followed by next most preferred fuel- kerosene. According to a WHO 2016 report, 94% of Nigerians primarily use wood, charcoal, coal and kerosene for cooking. According to IEA[25], biofuels continue to be the most consumed fuel for meeting primary energy demand in Nigeria over last several decades.



[25] https://www.iea.org/countries/Nigeria

Hence the existing circumstances do not affect the credibility of current baseline scenario in Nigeria.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

According to a study[26] published in IOSR Journal of Humanity and Social Science in March 2018, more than 80% of the population in Nigeria, particularly the rural dwellers use the traditional biomass cookstove for cooking with the proportion of households dependant on inefficient cookstoves for domestic cooking being significantly high. The study revealed that only 7.9% households used kerosene as alternative cookstove while other cookstoves usage including electric, liquefied petroleum gas and improved biomass cookstoves were non-existent. Hence the current baseline of use of traditional stoves is still valid.

Step 1.4: Assessment of the validity of the data and parameters

Data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the PoA period and which are no longer valid have been updated according to paragraph 291, CDM project standard for programmes of activities; version 02.0.

Step 2.1: Update the current baseline

The baseline emissions for the subsequent crediting period, have been updated based on the latest approved version of the methodology.

- Default IPCC values – Default IPCC values, other than ones defined in the methodology, have not been used and the ones specified in the latest version of the methodology are updated values.
- Emission factors, values and benchmarks- These have been updated in line with the latest version of methodology.
- The current baseline emissions have been updated for the subsequent crediting period Please refer to Section I.6. for details.
- Data and parameters that were fixed ex-ante and which were not monitored have been updated in accordance with the requirements of the applied methodology AMS II.G, version 11. Please refer to Section I.6.2 for details.

Ex-ante fixed parameters

$B_{old\ HH}$- Annual quantity of biomass used in absence of project activity

Historical data available on United Nations Statistics Division site was used for calculation of household fuelwood consumption by extrapolating the available data to 2018 using a second-order polynomial (quadratic) regression in R. The latest available factors (percentage of population using fuel wood, average household size) used in calculation of B_{old} value were taken from Nigeria Demographic and Health Survey 2018, hence in order to comply with same data vintage, the CME applied second order Polynomial regression to household wood fuel consumption values over a period of 18 years to calculate the 2018 consumption value . The reported consumption from 2000 to 2017 (available from http://data.un.org) was used. The calculation has been included in Nigeria baseline fuelwood consumption sheet.

f_{NRB} – Fraction of non-renewable biomass

The determination of the share of non-renewable biomass (fNRB) in the project area is based on report by C4 EcoSolutions (Pvt.) Ltd which has been calculated in accordance with Tool 30, version 2.

[26] Assessing the Extent of Traditional Biomass Cookstove Usage and Related Cooking Practices: Evidence from Rural Households in Northern Nigeria. IOSR Journal Of Humanities And Social Science (IOSR-JHSS) Volume 23, Issue 3, Ver.1(March. 2018) PP 39-46 e-ISSN: 2279-0837, p-ISSN: 2279-0845. www.iosrjournals.org.

Parameters used for calculation of f_{NRB}

HW_{region} - Average household wood fuel consumption, including fuelwood and charcoal in the country/region.

The household fuelwood and charcoal consumption values have been extrapolated to 2018 using a second-order polynomial (quadratic) regression in R. Household wood fuel and charcoal consumption values over a period of 17/18 years that is from 2000 to 2016 (charcoal) and 2000-2017 (wood fuel) was used to calculate the 2018 consumption value. In line with the requirement of Data/Parameter Table 1, Tool 30; the data has been sourced from Energy statistics database – United Nations Statistics Division[27]

TI_{region} - Non-domestic woody biomass including fuelwood and charcoal consumption for energy applications in the country/region

Non-domestic fuelwood and charcoal consumption values have been extrapolated to 2018 using a second-order polynomial (quadratic) regression in R. Commercial wood fuel and charcoal consumption values over a period of 10/11 years that is from 2007 to 2016 (charcoal) and 2007-2017 (wood fuel) was used to calculate the 2018 consumption value. In line with the requirement of Data/Parameter Table 2, Tool 30; the data has been sourced from Energy statistics database – United Nations Statistics Division[28].

MAI_{forest},& MAI_{other} - Mean Annual Increment of woody biomass growth per hectare of forest and other wooded land areas.

As required by Data/Parameter Table 4, Tool 30; this value has been sourced using option (b)- 2006 IPCC Guidelines for National Greenhouse Gas Inventories for "Above-ground biomass growth rates (t/ha-yr) for different ecological zones" (Chapter 4, Table 4.9). Use a weighted average based on the forest area of two different age categories (i.e. above and below 20 years)

F_{forest},& F_{other} -Extent of forest as well as other wooded land

In the study done by C4 EcoSolutions (Pvt.) Ltd, the forest and other wooded land cover for Year 2000 and 2018 was estimated using Hansen/UMD/Google/USGS/NASA spatial data, and disaggregated according to the FAO global ecological zones. The tree cover was estimated as the fractional area of each grid cell that is covered by the tree canopy (as the size of the grid cells are considerably larger than any individual tree). The total area of all the grid cells that contain some tree cover is roughly equivalent to the total area of the ecological zone. While FAO definitions consider all areas with >10% cover forests, areas with 5-10% cover other wooded lands, and <5% cover as other lands, in the present report in order to capture the forest dynamics and how they may be changing (due to loss or gain in tree cover), the calculations have given some consideration to the forest cover thereby accounting for any deforestation or degradation that results in a transition across the relevant thresholds (5% or 10%). In line with the requirements of Data/Parameter Table 5, Tool 30, option (b) official data has been used for determining this parameter.

P_{forest},& P_{other} -Extent of non-accessible area within forest and other wooded land areas.

According to tool 30, P_{forest} and P_{other} includes "Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest/other wooded land areas. To define "geographically remote area", the Tool clarifies that DNAs/PPs may consider proximity to roads or rivers. For example, forests/other wooded lands that are beyond the average distance travelled to collect firewood can be considered non-accessible. The information of the average travel distance may be sourced from national studies or peer-reviewed literature, or surveys in the project area.

[27] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW

[28] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aCH

Woody biomass density increases significantly as a function of distance from the edge of a settled area. The Global Alliance for Clean Cookstoves found that in urban areas women spend an average of 1.4 hours and men an average of 2.2 hours collecting fuelwood. This average was higher for women in rural areas, 1.8 hours, and lower for men, 2.1 hours[29]. Assuming that the harvesting of fuelwood takes at least half of the time spent, and an average walking speed of 4 km/hr over uneven terrain, the average one-way walk distance to fuelwood source can be conservatively estimated to be less than 2.5 km. Forested areas beyond the harvestable distance of 2.5 km were therefore determined to be geographically remote. The total available woody cover was estimated by subtracting the woody cover of the protected areas and the woody cover of geographically remote areas from the total woody cover[30].

To calculate this accessible woody cover, all the areas that are within 2.5 km of a road, leaving protected area was masked out. The protected cover has similarly been determined by masking out all areas that don't fall within a protected area. In line with Option (b) of Data/Parameter Table 6; Tool 30; the extent of protected area has been sourced from National study that is Hansen/UMD/Google/USGS/NASA spatial data. Determination of 2.5 km as the average travelling distance for wood collection has been derived from literature review.

All estimations/ extrapolations/projections have been included in the fNRB calculation spreadsheet, which is submitted along with this PoA-DD.

$NCV_{biomass}$ – Net calorific value of biomass
The value is in accordance with AMS II.G version 11.

$EF_{projected\_fossilfuel}$- emission factor of the fossil fuel projected to be used in absence of project activity
The value is in accordance with AMS II.G version 11.

L-Leakage
The value is in accordance with AMS II.G version 11.

Step 2.2: Update the data and parameters

Ex-ante Parameter	1st PoA Period	2nd PoA Period
$B_{old, i, j}$ (tons/year)	4.21 (Kaduna); 5.1129 (Kano)	5.72
f_{NRB} (fraction)	0.93	0.96
$NCV_{biomass}$ (TJ/ton)	0.015	0.0156
$EF_{projected\_fossilfuel}$ (t CO_2/TJ)	81.6	73.2

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

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[29] Global Alliance for Clean Cookstoves. Guatemala Cookstoves and Fuel Market Assessment. 1–102 (2013).

[30] More details have been included in the fNRB report being submitted along with this PoA DD

The choice of methodology for a typical SSC-CPA will be AMS IIG Version ~~03~~11. The activities of each SSC-CPA will entail the distribution of improved cooking stoves, which result in energy efficiency improvements to some application of non-renewable biomass, as required by AMS IIG Version ~~03~~11.

In the absence of the project activity, for the purposes of emissions reductions, the baseline is assumed to be the use of fossil fuels to meet similar thermal needs. In this case, as per AMS IIG Version ~~03~~11, the default value of ~~81.6~~73.2 tCO_2/TJ[3] (including CH_4 and N_2O emissions) for Sub-Saharan Africa is applied. In addition, Version ~~3~~ 11 allows a default leakage adjustment factor of 0.95 to be applied to B_{old} to account for leakages. This PoA will also use this default~~.~~

Because of the nature of traditional baseline stoves in use in the countries part of this POA – including three stone fires and traditional pot supports – it is not possible to ensure that these are disposed of. Therefore, this PoA will monitor the continued use of baseline stoves amongst users of ICS that are in operation in order to ensure that ~~fuel wood consumption of those~~baseline stove usage is accounted for in calculation of emission reduction in accordance with ~~s is excluded from B_{old} (option (b) Paragraph 20~~ Equation 2 of AMS II.G Version 11.0~~3.0).~~

According to the methodology, $B_{y,savings}$ may be calculated in a number of ways ~~(as per Options 1, 2 and 3 in Paragraph 6)~~ and this PoA will allow the use of Option ~~2~~ 3 that is Water Boiling Test for estimation of $B_{y,\ savings}$ in CPAs under this POA. ~~Option 1 is excluded because of the need to perform a Kitchen Performance Test, which will not be used in this PoA.~~

~~Option 3 is excluded because WBTs tend to be more accurate and easier to implement than controlled cooking tests, and WBTs can use a default for the original efficiency (thus efficiency tests only have to be conducted once on ICS). In all instances, the possible variation in performance of stoves of different vintages will be accounted for in calculating $B_{y,savings}$.~~

~~This PoA will use equations 1 (adjusted for leakage) and 3 (with B_{old} adjusted for second stove use) of methodology AMS-II.G version 03.0. A detailed explanation of how emissions reductions are estimated is included in section B.6.3 of Part II of this document.~~
Under option 3; the CPAs can use either equation 7 or equation 8 for estimating $B_{y,\ savings}$. The choice of option shall be stated clearly in the CPA in accordance with paragraph 50 of applied methodology.

I.6.2. Data and parameters fixed ex ante

~~*(Copy this table for each piece of data and parameter.)*~~

NB: not all of the following parameters will be reported in each CPA DD form. The parameters will be reported~~,~~ according to the option chosen for determining By,savings ~~from Section 6 of the methodology~~as per section I.6.1 of this document.

Data/Parameter	**$B_{old,HH}$**
Data unit	Tonnes / household / year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Based on the historical data
Value(s) applied	5.72
Choice of data or Measurement methods and procedures	Calculated from historical data.
Purpose of data	Calculation of baseline emissions
Additional comment	Calculation included in Appendix 4

Data/Parameter	$B_{old,i,j}$
Data unit	~~Tonnes / stove / year~~tons/annum
Description	Annual Quantity of woody biomass used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type i and batch j. ~~in Kaduna or Kaduna and Kano States, Nigeria~~
Source of data	~~Baseline Survey 2010 and Follow-up Survey, June 2011 for Kaduna and Baseline Survey 2012 for Kaduna and Kano~~ $B_{old,HH} \div N_{d,HH}$
Value(s) applied	~~4.21 (Kaduna) or 5.1129 (Kano)~~ 5.72
Choice of data or Measurement methods and procedures	~~The baseline surveys assessed the average woody biomass usage per appliance per annum amongst users of traditional 3 stone fires or traditional pot supports according to interviews. This data was gathered according to: Standard for Sampling And Surveys CDM Project Activities and Programme of Activities (Version 02); CDM EB69 Annex 4.~~ ~~Note: The wood-to-charcoal factor is 6:1 as per the 1996 IPCC guidelines (Reference Manual, page 1.45).~~ ~~Kaduna baseline~~ ~~A survey was administered in a total of 251 randomly selected kitchens in peri-urban and rural areas in Kaduna State in 2010. The survey used questions to investigate woodfuel consumption – asking both about volumes used as well as expenditure, which was then related to prices ascertained from woodfuel vendors. To cross-check findings, typical volumes of wood used daily were also weighed in kitchens. These data collectively gave the annual fuel consumption data per household on 5.29 tonnes/year. The baseline fuel consumption was found to be uniform across rural and peri-urban locations. (see Appendix 4 for detail).~~ ~~A follow-up survey in June 2011 was conducted on 97 households in Kaduna State with the aim to capture the average number of stoves used simultaneously for cooking per family unit to further refine woodfuel consumption. Based on this study a baseline adjustment factor has been applied to B_{old} to account for fuelwood used in a second baseline stove for the 60.8% of households in the baseline study who reported using a second stove at least once per week. This baseline adjustment factor is based on the mean number of stoves used per household averaged across the entire baseline sample, calculated to be 1.23 stoves/household, and equates to 1/1.23 = 0.813. The value of B_{old} applied in this SSC-PoA-DD for woodfuel baseline stoves (4.21 tonnes/year) incorporates this 0.813 baseline adjustment factor and a 0.97 adjustment factor for the seasonal variation in fuelwood consumption, which takes into account households that switched to other fuels when it rains.~~ ~~Kano baseline~~ ~~A survey was administered in randomly selected kitchens in urban, peri-urban and rural areas in Kaduna and Kano States in 2012. The survey used questions to investigate woodfuel consumption – asking both about volumes used as well as expenditure, which was then related to prices ascertained from woodfuel vendors. To cross-check findings, typical volumes of wood used daily were also weighed in kitchens. These data collectively gave the annual fuel consumption data per household on 5.41 tonnes/year. The baseline fuel consumption was found to be uniform across rural and peri-urban locations. (see Appendix 4 for detail).~~ ~~A baseline adjustment factor has been applied to B_{old} to account for fuelwood used in a second baseline stove for the 51% of households in the baseline study who reported using a second stove at least once per week. This baseline adjustment factor is based on the mean number of stoves used per~~

	~~household averaged across the entire baseline sample, calculated to be 1.23 stoves/household, and equates to 1/1.23 = 0.813. The value of B_{old} applied in this SSC-PoA-DD for woodfuel baseline stoves (5.11 tonnes/year) incorporates this 0.813 baseline adjustment factor and a 1.29 adjustment factor for the seasonal variation in fuelwood consumption, which takes into account households that switched to other fuels when it rains~~. Based on published data. It is envisaged that only a single project stove will be distributed/installed per household hence the value of $B_{old,i,j}$ is equal to the value of $B_{old,HH}$. The value of $N_{d,HH}$ will be monitored at the time of registration of project stove to ensure that only one project device is present per household.
Purpose of data	Calculation of baseline emissions
Additional comment	none

Data / Parameter:	$f_{NRB,y}$
Data unit:	Fraction
Description:	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data:	Independent third-party report. ~~FAO Forest Resource Assessment 2010 Global Tables: Tables 2, 6, 11~~ ~~FAO Global Forest Resource Assessment 2000, Table 14~~ ~~2003 IPCC Good Practice Guidance for Land-Use Change and Forestry, Chapter 3~~ ~~2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.9~~
Value(s) applied:	~~0.93~~0.96
Choice of data or Measurement methods and procedures:	~~Use of nationally approved sources of data~~ ~~Calculated as provided for in AMS-II.G, version 03, and EB 67 Annex 22~~ Calculated as per "Tool 30: calculation of the fraction of non-renewal biomass"; version 2.0
Purpose of data	Calculation of baseline and project emissions
Additional comment:	The fNRB report and calculation sheet being submitted with the PoA DD can be referred for details of calculation

~~**Data / Parameter:**~~	~~η_{old}~~
~~Data unit:~~	~~Fraction~~
~~Description:~~	~~Efficiency of the system being replaced~~
~~Source of data:~~	~~AMS IIG Version 03 default figure~~
~~Value(s) applied:~~	~~0.10~~
~~Choice of data or Measurement methods and procedures:~~	~~AMS II.G Version 03, Option 2. The 0.10 default value may be used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.~~
~~Purpose of data~~	~~Calculation of baseline emissions~~
~~Additional comment:~~	

Data / Parameter:	$EF_{projected\_fossilfuel}$
Data unit:	TCO_2/TJ

Description:	Emission factor of the fossil fuel ~~most likely to~~projected to be used ~~be adopted~~ for substitution of non-renewable biomass
Source of data:	~~IPCC d~~Default value for Sub-Saharan Africa as provided in Version ~~3~~ 11 of AMS IIG
Value(s) applied:	~~81.6~~73.2
Choice of data or Measurement methods and procedures:	Regional default value of fossil fuel emission factor given in AMS II.G; version 11.~~IPCC default that AMS IIG states can be used.~~
Purpose of data	Calculation of baseline and project emissions
Additional comment:	none

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/ tonne
Description:	Net Calorific Value of non- renewable woody biomass
Source of data:	IPCC default value for woodfuel
Value(s) applied:	0.0156
Choice of data or Measurement methods and procedures:	IPCC default applied
Purpose of data	Calculation of baseline and project emissions
Additional comment:	none

Data / Parameter:	**L**
Data unit:	Fraction
Description:	Leakage adjustment factor
Source of data:	Default ~~data~~value, as per AMS IIG Version ~~03~~11.
Value(s) applied:	0.95
Choice of data or Measurement methods and procedures:	A net to gross adjustment factor (0.95 default) is applied ~~in order to adjust B_{old}~~ to $B_{y,savings,i,j}$ to account for leakages as per paragraph ~~13 (a)~~ 39 of the AMS II.G, version ~~3~~ 11 methodology.
Purpose of data	Calculation of baseline emissions
Additional comment:	none

I.6.3. Modalities for ex ante calculation of emission reductions

>>

The SSC-CPAs will calculate emission reductions through application of the following equations:

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y$$

where

- i - Indices for the situation where more than one type of project device is introduced to replace the pre-project devices.
- j - Indices for the situation where there is more than one batch of project device
- ER_y - Emission reductions during year *y* in t CO_2e
- $ER_{y,i,j}$ - Emission reductions by project device of type *i* and batch *j* during year *y* in t CO_2e
- LE_y - Leakage emissions in the year *y*

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\ \ fossil\ fuel}$$

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

~~where:~~

~~ER_y Emission reductions during the year y in tCO_2e~~

~~$B_{y,savings}$ Total biomass that is saved in tonnes during the monitoring year (*y*)~~

~~$fNRB_{,y}$ Fraction of biomass saved by the project activity in year y that has been established as non renewable biomass~~

~~$NCV_{biomass}$ Net calorific value of the non-renewable biomass that is substituted (IPCC default for woodfuel, 0.015 TJ/tonne)~~

~~$EF_{projected\_fossilfuel}$ Emission factor for the substitution of non-renewable biomass by similar consumers. The substitution fuel likely to be used by similar consumers is the methodology default of 81.6 tCO_2/TJ.~~

~~L_y Leakage factor in year '*y*'.~~

where

- $B_{y,savings,i,j}$ - Quantity of woody biomass that is saved in tonnes per cookstove device of type *i* and batch *j* during year *y*
- $N_{y,i,j}$ - Number of project devices of type *i* and batch *j* operating during year *y*
- μ_y - Adjustment to account for any continued use of pre-project devices during the year *y*
- $f_{NRB,y}$ - Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})
- $NCV_{biomass}$ - Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
- $EF_{projected\ \ fossil\ fuel}$ - Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers.

For emission factor of fossil fuel displaced by the project stoves, default value of 73.2 t CO2/TJ which is the emission factor for Sub-Saharan Africa has been used.

The value of f_{NRB} has been calculated using option 1 that is ex ante and shall be fixed for entire crediting period.

Calculating $B_{y,\ savings}$

According to the methodology, several options have been given for estimation of $B_{y,savings}$ ~~may be calculated in a number of ways (as per Options 1, 2 and 3 in Paragraph 6) and~~ . tThis SSC-PoA will allow the use of ~~only of Options~~ 2 option 3 in CPAs under this SSC-POA.

Under Option ~~2~~3, either of these two equations may be used by the SSC-CPA, however the choice of option shall be stated clearly in the CPA-DD and shall remain fixed for entire crediting period.

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

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

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

~~Where:~~

~~B_{old} Baseline Quantity of woody biomass used in the absence of the project activity in tonnes~~

~~η_{old} Efficiency of the baseline system/s being replaced. The 0.10 default value is used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.~~

~~η_{new} Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.~~

where

$B_{old,i,j}$	-	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type *i* and batch *j* .
$\eta_{new,i,j}$	-	Efficiency of the project device *i* and batch *j*
$\eta_{old,i,j}$	-	Efficiency of the old devices being replaced by project devices of type *i* and batch *j*
$B_{y=1,new,i,j,survey}$	-	Quantity of woody biomass used by project devices in tonnes per device of type *i* and batch *j*

$$B_{old,i,j} = B_{old,HH} \div N_{d,HH}$$

where

$B_{old,HH}$	-	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices (tonnes/household/year)
$N_{d,HH}$	-	Number of project devices per household (number)

~~In order to account for stoves which have been in operation for fractions of the monitoring period, the following formula is used:~~

$$Ny,i = \sum_{j=1}^{J_y} n_{y,j} \cdot t_{y,j}$$

~~Where:~~

~~$N_{y,i}$ Total number of stoves of vintage (*i*)[31] in operation for a full monitoring period equivalent within each SSC-CPA~~

~~$n_{y,j}$ Number of ICS operating in monitoring period *y* for j days,~~

~~*j* days since distribution of the ICS (or the start date of monitoring period for ICS distributed in prior monitoring periods) (whichever is later), until end of monitoring period~~

~~$t_{y,j}$ Fraction of monitoring period *y* that the stove is in operation ($t_{y,j} = j/J_y$). Note, for ICS distributed in prior monitoring periods $t_{y,j} = 1$.~~

~~J_y Total number of days in the monitoring period *y*~~

~~The baseline fuelwood consumption reports shows an average consumption of either 5.29 (Kaduna) or 5.41 (Kano) tonnes/household/yr. Note that this household average is later adjusted to fuelwood consumption per appliance by multiplying this number by baseline adjustment factors, which are based on the mean number of stoves used per household averaged across each~~

~~[31] Vintage shall be defined as the "age" of the ICS – ie. Number of years it has been in operation. – ie. all stoves below 1 year (or 365 days) of use belong to vintage 1, all stoves between 1 and below 2 years of use to vintage 2 and so on. Note that *i* will match the efficiency of the stove at a certain "age"; e.g. stoves vintage 2 will be grouped together and WBTs will dictate their $\eta_{new,i}$.~~

baselines entire sample, calculated to be 1.23 stoves/household for both baselines, and equates to 1/1.23 = 0.813 mean adjustment factor. In addition, the baseline woodfuel consumption is further adjustment for seasonal variation applying an average adjustment factor of 1.29. B_{old} is then valued as 5.11 tonnes/stove appliance/yr (14.014 kg/day) for Kaduna and Kano and a seasonal adjustment factor of 0.979 for Kaduna where B_{old} is then valued as 5.29*0.813*0.979= 4.21 tonnes/stove appliance/yr (11.54 kg/day)

For the purposes of calculating ex-ante emission reductions a baseline adjustment factor has been applied to B_{old} to account for woody biomass used in a second stove. This baseline adjustment factor is based on the mean number of stoves used per household averaged across the entire baseline sample. The percentage of households using multiple stoves is 51% (Kaduna and Kano) and 60.8% (Kaduna) and the multiple stove use adjustment factor (MSA) for both baselines is 1.23[32].

The percentage of households continuing to use a baseline stove in addition to an ICS will be monitored in order to address paragraph 20 (b) of the AMS II.G (version 3) methodology. The monitored (ex-post) percentage of ICS users continuing to use a baseline stove in addition to the ICS (parameter SS_y) will be compared to the ex-ante percentage found in the baseline and B_{old} will be adjusted proportionally based on the proportional change in the percentage. The parameter used to calculate ex-post $B_{y,savings}$ will be $B_{old,adjusted}$ in order to account ex-post for fuel-wood used in baseline stoves in addition to ICS. This procedure is outlined here:

$$B_{y,savings} = B_{old,adjusted} \cdot \left[\sum_{i=1}^{n} N_{y,i} \left(1 - \frac{\eta_{old}}{\eta_{new,i}} \right) \right]$$

Where:

$N_{y,i}$ Total number of stoves of vintage (i)[33] in operation for a full monitoring period equivalent within each SSC-CPA

η_{old} Efficiency of the baseline system/s being replaced. The 0.10 default value is used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.

$\eta_{new,i}$ Efficiency of the system of vintage (i) being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

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[32] This factor was calculated as follows:
1. Each household's fuel consumption datum (only adjusted for seasons) was divided by its corresponding mean number of baseline stoves used. The results of all households in each country's/cluster dataset are averaged to obtain a baseline fuel consumption mean adjusted for seasons AND multiple stove use.
2. The fuel consumption mean only adjusted for seasons (average of all the samples in the country/cluster database) is divided by the fuel consumption mean adjusted for seasons AND multiple stove use (this is also a average of all the samples in the country/cluster database) to obtain the multiple stove use adjustment factors (MSA).
Note that this is slightly different from taking the mean number of stoves used per household across the sample and applying it to the baseline fuel consumption mean adjusted for seasons.

[33] Vintage shall be defined as the "age" of the ICS – ie. Number of years it has been in operation. – ie. all stoves below 1 year (or 365 days) of use belong to vintage 1, all stoves between 1 and below 2 years of use to vintage 2 and so on. Note that i will match the efficiency of the stove at a certain "age"; e.g. stoves vintage 2 will be grouped together and WBTs will dictate their $\eta_{new,i}$.

and for Kaduna State

$B_{old,adjusted} = B_{old} * [1.23/(1+(SS_y / 0.608) * (1.23-1))]$

B_{old} Baseline Quantity of woody biomass used in the absence of the project activity in tonnes = 4.21tonnes/stove/year

SS_y Percentage of households that continue to use baseline stoves simultaneously with ICS at least once per week (see section B.7.1. of the SSC-PoA-DD). If SS_y is less than or equal to 60.8% no discount shall be given to B_{old} – since that discount is already embedded on the original baseline fuel consumption. If more than 60.8% is found using a second stove, the difference between SS_y and 60.8% is taken and the discount is applied.

0.608 Percentage of households in the baseline study that use a second stove simultaneously.

1.23 Multiple stoves adjustment factor for simultaneous second stove.

and for Kaduna and/or Kano State

$B_{old,adjusted} = B_{old} * [1.23/(1+(SS_y / 0.51) * (1.23-1))]$

B_{old} Baseline Quantity of woody biomass used in the absence of the project activity in tonnes = 5.11tonnes/stove/year

SS_y Percentage of households that continue to use baseline stoves simultaneously with ICS at least once per week (see section B.7.1. of the SSC-PoA-DD). If SS_y is less than or equal to 51% no discount shall be given to B_{old} – since that discount is already embedded on the original baseline fuel consumption. If more than 51% is found using a second stove, the difference between SS_y and 51% is taken and the discount is applied.

0.51 Percentage of households in the baseline study that use a second stove simultaneously.

1.23 Multiple stoves adjustment factor for simultaneous second stove.

As specified in the AMS II.G (version 3) methodology, B_{old} is determined by using one of the following two options:

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

Or

Calculated from the thermal energy generated in the project activity as:

$$B_{old} = \frac{HG_{p,y}}{NCV_{biomass} * \eta_{old}}$$

The project proponents select option (a) directly above to determine B_{old}.

Note: Methodology AMS II.G (version 3), requires that monitoring ensures that (a) Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or (b) If baseline stoves continue to be used, monitoring shall ensure that the fuelwood consumption of those stoves is prorated in B_{old}. In this SSC-PoA option (b) is used. B_{old} will be adjusted ex-post to account for the wood used in any baselines stoves that continue to be in used in addition to the ICS. The baseline surveys determined the percentage of households that are currently using more than one wood-burning stove and are likely to use more than one stove after the ICS is provided (See Appendix 4). This surveys provide adjustment factors to account for the amount of wood used by that second stove, thus B_{old} is adjusted based on these factors.

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

(Copy this table for each piece of data or parameter.)

NB: not all of the following parameters will be reported in each CPA DD form, according to the option chosen for determining $B_{y,savings}$ from Section 6 of the methodology

Data/Parameter	***Z***
Data unit	Number of stoves sold
Description	Total number of stoves sold and registered in the Project Database Records
Source of data	Project Database records
Value(s) applied	~~Dependent on CPA sales records. For the purposes of ex-ante calculation of expected emission reductions, the maximum number of stoves per CPA will be calculated on CPA-level and will vary by technology.~~ To be mentioned in individual SSC-CPA DDs.
Measurement methods and procedures	Detailed sales information will be collected for each customer, either using electronic or paper-based means. On electronic means, the data will be collected by SMS (i.e. mobile phone 'short message service' text) or Information and Communication Technologies ('ICT' – such as PDAs). Information that is entered into the database includes the name of the customer, address/ description of location, contact telephone number(s), unique serial number of the stove, retailer ID, and date of purchase. Sales information submitted via SMS/ ICT will automatically enter the database. Written registration cards will be entered manually into the same database. The unique serial number of each stove sold ~~corresponds~~ will correspond to a CPA. The date that the stove is registered in the database shall be ~~utilized~~ used for~~to determine~~ determining vintage of the stove.
Monitoring frequency	Continuously until the database is frozen for a CPA
QA/QC procedures	~~Where electronically submitted, once a given phone number has been used to submit information for a defined number of stoves, the software will block it from a predetermined number of future submissions. Stove sellers' phone numbers may be exempted from this by prior agreement.~~ Project distribution staff will spot-check end-users to verify that information submitted was factual.
Purpose of data	~~Calculation of baseline and project emissions~~cross checking
Additional comment	none

Data / Parameter:	~~n_y~~$N_{y,i,j}$
Data unit:	Quantity
Description:	Number of ~~ICS~~ project devices of type i and batch j operating in a year. ~~in year *y* operating for *j* months~~
Source of data:	~~Sales records~~ sample survey
Value(s) applied	~~Dependent on CPA sales~~ To be monitored at CPA level~~records~~

Measurement methods and procedures:	The percentage of stoves found to be still in operation based on the sampling plan in each monitoring period will be applied to the total number of stoves distributed in each CPA (according to the ICS sales records in the monitoring database and the applicable sample frame). Sampling standard shall be used for determining the sample size to achieve 95 [34] /10 confidence precision. A discount shall be applied based on the percentage of devices operational as determined by the sample survey, e.g. if survey shows that 10% of the devices is non-operating, an adjustment factor of 0.9 shall be applied to number of project devices commissioned in a batch. Separate samples shall be taken for each batch. ~~The proportion of sampled ICS found to be in operation during each monitoring period will be applied to the total number of stoves for each CPA when calculating emission reductions. If, based on the sample size selected in any monitoring period, the confidence/precision requirements set out in EB86 Annex 3 are not satisfied, then CPA Implementers will follow the procedures outlined in the Monitoring Plan (Part II Section B.7.2 of the SSC-PoA-DD) and increase the sample size until the required level of confidence/precision is met or appropriate conservative values as defined by EB86 Annex 3 (paragraph 17).~~
Monitoring frequency:	~~At least once every two years~~annually/biennially
QA/QC procedures:	The unique reference number of each stove shall be logged in the monitoring database showing the total number of stoves sold. Data from the sampling plan will be collected in each monitoring period by trained project staff and applied in the emission~~s~~ reduction~~s~~ calculations. Internal cross-checks by the CME or CPA Implementer will be undertaken as QC.
Purpose of data	Calculation of baseline and project emissions
Additional comment:	This parameter will be monitored annually, beginning 1 year after the date of registration. The monitoring will be done by surveys, undertaking a representative sample from the sales records to ensure the stoves are still in place. The process for determining the sample size is described in Part II Section ~~B~~I.7.2.

Data / Parameter:	~~SS_y~~ μ_y
Data unit:	~~Percentage~~fraction
Description:	Adjustment to account for any continued use of pre-project devices during the year *y for CPAs using* $B_{old,i,j}$ *for calculation of* $B_{y,savings}$ ~~The percentage of ongoing baseline stove use within the population of in-use ICS during a monitoring period. This is needed to calculate $B_{old, adjusted}$.~~
Source of data:	~~Monitoring~~ Survey of a representative sample to determine the ~~of~~ ongoing baseline stove use will be undertaken using the sampling approach outlined in Part II section ~~B~~I.7.2 of the SSC-PoA-DD ~~(to meet EB86 Annex 3 confidence/precision requirements).~~
Value(s) applied	To be monitored at CPA level. ~~This will be a monitored parameter, so will only be available ex-post.~~ ~~As a conservative approach to ex-ante calculations, the percentage of households in the baseline studies using a second stove at least once per week (51% - Kaduna and Kano or 60.8% - Kaduna), resulting in a mean total household stove usage 1.23 for both baselines, has been used to calculate the ex-ante baseline adjustment factor of 1/1.23 = 0.813. This ex-ante baseline adjustment factor has been applied to B_{old} in order to subtract fuelwood used in these second stoves resulting in the B_{old} estimate of 4.21 (Kaduna) or 5.11 (Kano) tonnes/year applied for the purpose of calculating expected emission reductions.~~

[34] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements under paragraph 46 of the applied methodology shall apply.

Measurement methods and procedures:	~~A survey will asking households if they use a second (baseline) stove at least once per week, as per the monitoring plan outlined in Part II Section B.7.2 of the SSC-PoA-DD. SS_y will be calculated in each monitoring period as follows: the number of sampled households with in-use ICS that also continue to use a baseline stove divided by the total number of in-use ICS in the sample.~~ The CPAs can use either of the options provided in the applied methodology, AMS II.G, version 11 (Data/Parameter Table 10) for determining the value of μ_y.
Monitoring frequency:	~~At least once every two years~~annually/biennially
QA/QC procedures:	Data for this parameter will be collected using the same survey for the parameter ~~n_y~~$N_{y,i}$ (in-use appliances) conducted by trained project staff members. Internal cross-checks by the CME or CPA Implementer will be undertaken as QC.
Purpose of data	Calculation of baseline and project emissions
Additional comment:	~~See Part II section B.7.2 of the SSC-PoA-DD for more detail on monitoring procedures This parameter is used to address paragraph 20 (b) of the AMS II.G (Version 3) methodology.~~ If equation 7 under option 3 (WBT) is used combined with direct measurement of Biomass new, then $\mu_{y,i,j}$ (parameter 2) may be assumed as 1.0. When the data loggers are used, the days when only project devices or only pre-project devices are used will be attributed accordingly. The days where both devices have been used, if the data loggers are able to detect and record the time each device has been used (e.g. in hours), the share in the total duration of utilization will be used to attribute a fraction of this day to one or to the other device. Alternatively, if the data loggers are not able to determine the duration of the utilization, but only the situation of the device being on or off (i.e. used or not used during that day), the share of 50:50 may be used

~~**Data / Parameter:**~~	~~t_{yj}~~
~~Data unit:~~	~~Fraction~~
~~Description:~~	~~Fraction of CPA monitoring year (*j*) elapsed since purchase of stove~~
~~Source of data:~~	~~ICS registration data and data from sampling plan~~
~~Value(s) applied~~	~~Dependent on date of purchase of stoves. Value = *j* weeks since distribution/12~~ ~~Where stoves were purchased during previous CPA monitoring periods, this value will be set to 1.0.~~
~~Measurement methods and procedures:~~	~~ICS registration data will provide a simple means to calculate the time elapsed since the registration of ICS in the registration database, and thus the period during a single monitoring period~~
~~Monitoring frequency:~~	~~Continuously~~
~~QA/QC procedures:~~	~~The values will be quality assured by way of the spot-checking undertaken throughout the life of the CPA. This will involve periodic visits to a random subsample of the population.~~
~~Purpose of data~~	~~Calculation of baseline and project emissions~~
~~Additional comment:~~	~~Purchase date is used as indication of date of commencement of operation of the ICS. This parameter will not be monitored per se, but the data will be entered into a database when stoves are sold/distributed. Once the purchase date is entered into the database, which will be on-going as new stoves enter people's homes, no further monitoring will take place.~~

Data / Parameter:	$\eta_{new,i,}$~~$_j$~~
Data unit:	Fraction

Description:	Efficiency of the ~~system~~ device type i and batch j being deployed as part of the project activity
Source of data:	Efficiency test report ~~CPA-dependent based on results of Water Boiling Test every year of operation, *ex-post*~~
Value(s) applied	To be monitored at CPA level~~See individual SSC-CPA DDs.~~
Measurement methods and procedures:	~~The tests will be coordinated by the CME and undertaken following WBT protocol 3.0 (or more recent version at the discretion of the CME) by a trained professional from the CME or CPA Implementer or an experienced third party.~~ Efficiency may be determined using any of the following 1. The efficiency of the project devices shall be based on certification by a national standards body or an appropriate certifying agent recognized by that body; 2. Alternatively, manufacturer specifications on efficiency based on water boiling test (WBT) may be used as per directives given in methodology. 3. If the efficient cookstoves are produced by a manufacturer with a recognized management system in place (e.g. ISO certification) to ensure that the individual equipment produced do not vary beyond the range of acceptance limits (e.g. characteristics such as materials, critical dimensions). Directives given in the methodology with respect to simplified approach may be used.
Monitoring frequency:	• ~~At least once every two years~~Recorded at the time of stove installation/distribution. • In the subsequent years after stove installation, the efficiency of project stoves to be estimated annually in accordance with options (b), (c) or (d) under paragraph 37 of the applied methodology. Choice of option to be mentioned in the CPA DD
QA/QC procedures:	Efficiency tests to be carried out in accordance with national or international standards / guidelines by an authorized agency.~~The WBT Protocol 3.0 or a more recent version will be used at CME discretion.~~
Purpose of data	Calculation of baseline and project emissions
Additional comment:	~~This monitoring will take place annually using testing procedures described in Section B.7.2, Paragraph I -- Annual efficiency check of appliances. The process for determining the sample size is described in Section B.7.2~~Loss in efficiency of project devices due to ageing shall be assessed in accordance with paragraph 37 of the applied methodology. The CPAs developed under the PoA can use either of the options stated below for determining drop in efficiency of the project devices. (b) Manufacturer of project devices shall confirm with technical justification based on certification by a national standards body or an appropriate certifying agent recognized by that body that no decrease in efficiency of project device is envisaged during the crediting period; or (c) Determine the rate of efficiency drop for a representative sample of the first batch of project device i in year y and assume that same rate of loss in efficiency applies to all other batches. In other words, it may be assumed that the degradation of efficiency measured in a representative sample of the first batch of project devices i apply to all subsequent batches. The efficiency of the project devices in the first batch has to be monitored annually through representative samples and this rate of loss in efficiency may be applied correspondingly to all batches; (d) Determine the loss in efficiency annually from a representative sample of each batch and use the actual loss rate that is measured. CPA DD to clearly mention the option selected.

Data / Parameter:	$B_{y=1,new,i,\ j,survey}$
Data unit:	tonnes
Description:	Quantity of woody biomass used by project devices in tonnes per device of type *i*.
Source of data:	Sample survey of end user or direct measurement at each end user locations.
Value(s) applied	To be monitored at CPA level.
Measurement methods and procedures:	Determined in the first year of the introduction of the devices (e.g. during the first year of the crediting period, y=1) through measurement campaigns at representative households and/or sample survey. Sample surveys to estimate this parameter, that are solely based on questionnaires or interviews (i.e. that do not implement measurement campaigns) may only be used if the following conditions are satisfied: • Pre-project devices have been completely decommissioned and only efficient project device(s) are exclusively used in the project households; • If multiple devices are used in the project, it is possible from the results of the survey questions to clearly differentiate the quantity of woody biomass being used by each device. In other words, if more than one device, or another device that consumes woody biomass, are in use in project households, then the sample survey needs to distinguish the quantity of biomass used by the project device and the other devices that use biomass
Monitoring frequency:	Once within first year of project installation
QA/QC procedures:	Survey to be conducted in accordance with "Standard for sampling and surveys for CDM project activities and programme of activities, version 08.
Purpose of data	Calculation of baseline and project emissions
Additional comment:	none

Data / Parameter:	Nd,HH
Data unit:	number
Description:	Number of project devices distributed per household
Source of data:	To be monitored at CPA level
Value(s) applied	To be mentioned in individual SSC-CPA DDs for CPAs that have already been implemented, else to be declared in the first monitoring report.
Measurement methods and procedures:	Recorded at the time of stove installation/distribution
Monitoring frequency:	Once at the time of CPA implementation
QA/QC procedures:	
Purpose of data	Calculation of baseline and project emissions
Additional comment:	Results of ex post monitoring/survey not to be used for determining this parameter.

Data / Parameter:	η_{old}
Data unit:	Fraction
Description:	Efficiency of pre-project device
Source of data:	default
Value(s) applied	0.10/0.20
Measurement methods and procedures:	Recorded at the time of stove installation/distribution

Monitoring frequency:	Once at the time of CPA implementation
QA/QC procedures:	At the time of project stove distribution/installation, the nature of baseline stove with respect to it being a i. three-stone fire using firewood (not charcoal), ii. conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney iii. other types of devices, not included in categories above shall be recorded. For categories (i) & (ii) default value of 0.10 shall be used, & for baseline stoves belonging to category (iii) default value of 0.20 shall be used.
Purpose of data	Calculation of baseline and project emissions
Additional comment:	Fixed for each individual household included in the CPA

Data / Parameter:	**Life Span**
Data unit:	years
Description:	The operating life- time of the project device.
Source of data:	Manufacturer (certified by a national standards body or an appropriate certifying agent recognized by that body)
Value(s) applied	To be declared in individual SSC CPA DD
Measurement methods and procedures:	none
Monitoring frequency:	Recorded once at the time of CPA implementation
QA/QC procedures:	none
Purpose of data	Methodology requirement
Additional comment:	none

Data / Parameter:	**Date of commissioning of batch j**
Data unit:	date
Description:	Stoves can be grouped in batches and latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch.
Source of data:	CPA database
Value(s) applied	To be reported for each batch in monitoring report
Measurement methods and procedures:	none
Monitoring frequency:	Recorded at the time of commissioning of last stove in a batch
QA/QC procedures:	none
Purpose of data	Methodology requirement
Additional comment:	none

Data / Parameter:	**Date of commissioning of project device i**
Data unit:	date
Description:	Date of commissioning of individual stove
Source of data:	CPA database
Value(s) applied	Reported in emission reduction calculation sheet for a monitoring period
Measurement methods and procedures:	none

Monitoring frequency:	Recorded at the time of installation or distribution or completion of registration process of an individual stove.
QA/QC procedures:	none
Purpose of data	Methodology requirement
Additional comment:	none

I.7.2. Sampling plan

>>

As per *Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities* [35] *; version 08.0,* the sampling plan is the following:

(a) Sampling Design

Due to the large number of ICS envisioned to be distributed as part of the CPAs to be included in the SSC-PoA, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling will be undertaken as part of a SSC-PoA-wide (by grouping and sampling across CPAs) Sampling Plan that is designed in line with the requirements of the "Standard for sampling and surveys for CDM project activities and programme of activities" from EB86, Annex 3 (the *Sampling standard*).

(i) Objective and Reliability Requirements:

The objective is to obtain an unbiased and reliable estimate of the proportion or mean value of the following key variables over the course of the crediting period, and with 9595 [36] /10 confidence/prevision (as per paragraph 21 23 of Standard for sampling and surveys for CDM project activities and programme of activities; version 08.0EB 86 Annex 3). for annual and 95/5 for biennial sampling across CPAs. In case a single CPA is sampled or sampling is not done across CPAs, 90/10 precision for annual and 95/5 precision shall be required for biennial sampling.

Monitored Parameters:

Sr. no	Parameter	Description of Parameter	Frequency
1	$Ny_{i,j}$	Number of ICS still in operation	Annual/biennial
2	μ_y	Adjustment to account for any continued use of pre-project devices. (in case equation 7 of methodology is used)	Annual/biennial
3	$\eta_{new,i,j}$	Efficiency of device type 'i'; batch 'j'	Annual
4	$B_{y=1,new,i,survey}$	Quantity of woody biomass used by project devices in tonnes per device. (in case equation 8 of applied methodology is used)	Once, within 1st year of project start date

	Parameter	Description of Parameter

[35] EB 86 Report Annex 3

[36] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

~~$n_{y,i}$~~		~~Number of ICS still in operation, proportion of installed ICS to be determined by sampling (p_n).~~
	~~SS_y~~	~~Percentage of continued baseline stove use among ICS households in the database~~
~~$\eta_{new,i}$~~		~~Thermal Efficiency of operational ICS~~

(ii) Target Populations:

- The target population for ~~the proportion of ICS still in operation ($n_{y,i}$) and for percentage of continued baseline stove use among ICS households in the database (SS_y) of this SSC-POA~~ parameters 1,2 and 4 are all households in the SSC-~~POA~~ PoA database which are using fuelwood in ICS distributed under the SSC-~~POA~~ PoA for cooking.
- The target population for ~~efficiency of new appliances ($\eta_{new,i}$)~~ parameter 3 is the set of stoves ~~(same model and manufacturer) distributed of vintage *i* across CPAs that are working and are in the database.~~that are operational and belong to same model and vintage.

(iii) Sampling Frame

To ensure the homogeneity of the CPAs included for a single sampling plan, two sampling frames shall be defined. The CPAs are to be implemented in ~~-~~urban, peri-urban and rural households of same geographic location of Nigeria, thus it is expected that the geographical locations do not have influence on the parameter of interest. Therefore, all these ~~3~~ 4 parameters can be assumed to be highly homogeneous ~~for each ICS model~~ regardless of how the end user group and distribution/installation location is defined. The Sampling Frame for individual parameters have been defined in the following paragraphs

~~1) Sampling frame for proportion of ICS still in operation ($n_{y,i}$) and percentage of continued baseline stove use among ICS households in the database (SS_y)~~

The sample frame refers to all the information sources on the Database. There are two primary mechanisms for data collection: the SMS/ICT system and paper registration card for newly distributed ICS and the Monitoring Survey (which includes a household questionnaire and visual inspection of ICSs) that will be used throughout the lifetime of the SSC-PoA. The SMS/ICT data and/or paper registration card (or equivalent) is used to populate the stoves Database and the Monitoring Survey follows the ~~EB86 Annex 3~~ "Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities"; version 08.

The SSC-POA is open to different CPA Implementers and different models of ICS. As explained below (on section "sampling method"), to take the different characteristics of different CPA Implementer and ICS models into consideration, CPAs shall be grouped together to create a Primary Sampling Unit which is homogenous. ~~As per EB 86 Annex 3, section 5, paragraph 21,~~ Paragraph 22 of the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities"; version 08, allows for the use of a single sampling plan covering a group of CPAs, provided the homogeneity of population can be demonstrated, or differences are taken into account in the sample size calculation. ~~, a 95/10 confidence/precision is applied for annual and 95/5 for biennial sampling.~~As per paragraph 23, 95[37]/10 confidence/precision shall be applied for sampling surveys in all cases, whether the CPAs are grouped together or when sampling is conducted at the CPA level for CPAs that are solely composed of "microscale CDM units" as defined in the Methodological tool "Demonstration of additionality of microscale project activities".

[37] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply- 90 % confidence interval and 10% margin of error for annual sampling and 95% confidence interval and 10% margin of error for biennial sampling.

~~In case a single CPA is sampled or sampling is not done across CPAs, 90/10 precision for annual and 95/5 precision shall be required for biennial sampling.~~

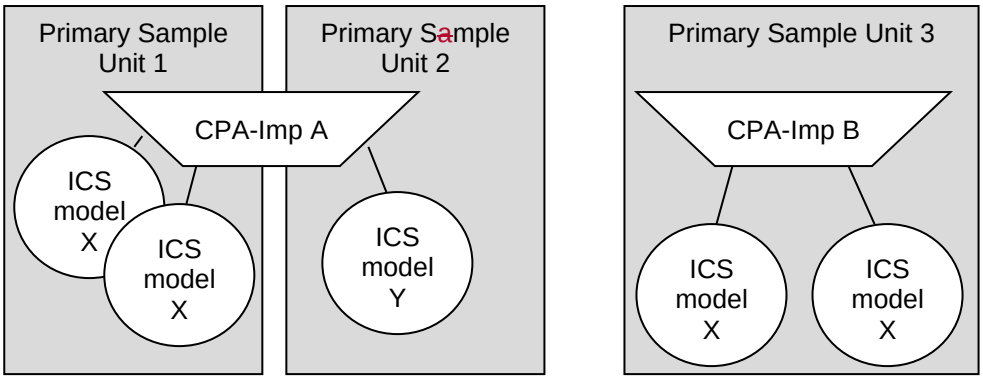
1) Sampling frame for proportion of ICS still in operation ($N_{y,i}$)

The first step is to identify the Primary Sampling Units. ~~Primary sampling units are CPAs which have:~~
~~The same CPA Implementer~~
~~The same ICS model~~

~~Ie. CPAs with the same CPA Implementer and same ICS model can therefore be grouped together and form a Primary Sampling Unit. In the event the SSC-POA has two different CPA Implementers using the same ICS model, these form two different Primary Sampling Units. Same is true if the same CPA Implementer has two different ICS models being implemented – this will form two Primary Sampling Units.~~
~~The below schematics illustrates the example used above. This is justified by the fact that CPA Implementer might vary in terms of performance and it is important for the CME to collect and monitor accurate data for each CPA Implementer distributing each stove model.~~
Factors such as model of the ICS or implementer of CPA do not effect parameter $N_{y,i}$ since no of stoves that are operational are largely independent of who is distributing/installing stoves or the type of stove being distributed. Moreover, the CME has put in place measures to regulate the activities of CPA implementers with regard to distribution/installation and after sales services thereby resulting in all CPA implementers following more or less similar practices. Therefore Primary sampling unit in case of parameters $N_{y,i}$ is independent of CPA implementer or model of stove.

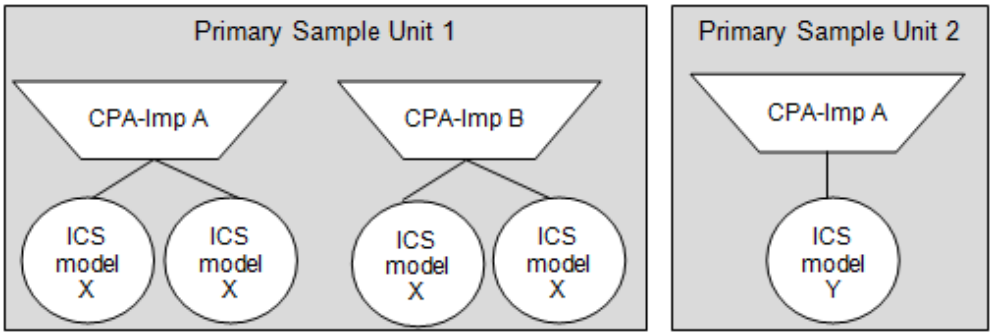
~~2)~~
2) Adjustment to account for any continued use of pre-project devices (μ_y)

Alike $N_{y,}$j, factors such as model of the ICS or implementer of CPA do not effect (μ_y) since continued use of pre-project devices is largely dependent on cooking practices within the population rather than on who is distributing/installing stoves or the type of stove being distributed. Hence a single primary sampling unit can be used for different CPA implementers or different models of stoves provided they have similar design or working principle.



3) Thermal Efficiency of operational ICS ($\eta_{new,i}$)

The thermal efficiency of operational ICSs shall vary in accordance with its model, but not within different CPA Implementers. Hence for parameter $\eta_{new,i}$ the Primary Sampling Unit shall be defined as the group of ICSs of the same model and same vintage. If the same CPA Implementer has two different ICS models being implemented in the same vintage – this will form two Primary Sampling Units. Finally, two primary sampling units will be formed by ICS from two different vintages and all other factors (ICS model and CPA Implementer) remaining equal. The below schematics illustrate the example used above assuming all stoves in the schematic are in one vintage.



For example, if different CPA Implementers are implementing CPAs using an ICS model "Y" for the past 3 years. In order to evaluate the thermal efficiency of the different vintages of the same stove "Y", the primary group shall consist of all ICSs under the POA (regardless of CPA Implementer) which are of the same vintage and same model – in this example this would be ICSs of vintage 2 (over one year old and under two years old) and vintage 3 (over two years old and below 3 years old).

4) Quantity of woody biomass used by project devices in tonnes per device ($B_{y=1,new,i,\ survey}$)

Similar to thermal efficiency $B_{y=1,new,i,\ survey}$ shall vary in accordance with its model, but not within different CPA Implementers. For this parameter, CPAs with the same ICS model can be grouped together and form a Primary Sampling Unit. In the event the SSC-CPA has two different CPA Implementers using the same ICS model, these will form a single Primary Sampling Unit. However, if the same CPA Implementer has two different ICS models being implemented – this will form two Primary Sampling Units.

(iv) Sampling Method

The sampling method for all ~~three~~ four monitored parameters ~~n_y~~$Ny_{i,j}$, ~~SS_y~~ μ_y, $B_{y=1,new,i,\ survey}$ and $\eta_{new,i}$ is Simple Random Sampling and samples will be randomly selected from the primary sampling units as illustrated above. To ensure a random selection of ICS, random number generators shall be applied. Each ICS in the target population is uniquely identifiable by its unique ID number. Each ICS can thus be allocated a Sample Selection Number in each monitoring period, starting at 1 and increasing up to the total number of ICS in the Database for that pre-defined sampling frame. Applying the random number generators, the ICS can then be randomly chosen from the defined population up to the required sample size as calculated by the CME.

To determine the parameters, sampling will involve the following approaches (outcome in brackets):

$n_{y,i,j}$:	Visual inspection of the premises to see if ICS is operational and in use. Interview with end user if required to verify that ICS is still in use (Yes/No)
μ_y ~~SSy~~:	Interview with end user and visual inspection to determine if a baseline (replaced) stove is still being used in addition to ICS (Yes/No)
$B_{y=1,new,i,\ survey}$	Interview with end user for determining average quantity of fire wood used in the project stove per day. Measurement campaigns' for

estimation of consumption of wood in project households. (wood fuel quantity)

$\eta_{new,i}$: ICS will be tested using WBTs (ICS thermal efficiency)

The thermal efficiency of ICS ($\eta_{new,i}$) will be determined by the water boiling test. The thermal efficiency of ICS will be determined across CPAs using the same stove model and same vintage (Primary Sample Unit). Using the formulas below, the CME will randomly sample the required number of ICS from the primary sampling units. It is important to note that $\eta_{new,\ i}$ and hence the thermal efficiency test must take into consideration --and be conducted for-- each ICS vintage. As an illustrative example, consider a PoA that distributed a single ICS ~~manufacturer/~~model but had two vintages: 75% of the total ICS distributed have been in use for less than 365 days (ie. vintage 1) and 25% have been in operation for over 365 days but less than 730 days (ie. vintage 2). In this case, 2 Primary Sampling Units shall be formed with each sampling unit ~~represents~~ representing one vintage. For each vintage, ~~a~~ the number of ICSs is to be randomly selected and sampled and the sample sizes are to be determined using the below equations. The mean thermal efficiency of each vintage shall be used for calculating emission reductions for all stoves of vintage *i*. ~~Ie.~~ that is if $\eta_{new,i}$ for stoves vintage 1 is 26% and vintage 2 is 24%, then all ICS which have been in use for less than a year will use a thermal efficiency of 26% in its calculations, while stoves vintage 2 will use 24%. In the event the monitoring period ~~is~~ being over one year (let's use the example of 2 years), ~~and~~ an ICS ~~have~~ which began its operation on the first day of the monitoring period, the stove shall apply the equivalent number of days in operation under vintage 1 and the equivalent number of days of operation under vintage 2. For avoidance of doubt, in every monitoring period, all ICS vintages will be sampled and the thermal efficiency for each vintage shall be established and used for the calculation of emission reductions for that monitoring period.

(v) Sample Size

For the estimation of the proportion or mean value of the parameters investigated, the minimum sample size for each sample frame has to achieve the 95[38]/10 ~~threshold~~ confidence/precision irrespective of annual or biennial monitoring. ~~for annual and 95/5 for biennial monitoring periods). In case a single CPA is sampled or sampling is not done across CPAs, a 90/10 confidence/precision is required for annual sampling and 95/5 confidence/precision shall be required for biennial sampling.~~

The procedure to determine the sample of households will ensure that they adequately represent the broader project population, minimizing sampling error. Using a 95[39] per cent confidence level, and a 10 per cent margin of error, random samples will be selected from each Primary Sampling Unit. There are three parameters that will be estimated through sampling: the number of stoves still in operation during the monitoring period as determined by the monitoring survey (n_y $Ny_{,j}$), the fraction of baseline stoves in use within the population of operational ICS during a monitoring period (μ_y ~~SS_y~~) and the average ICS efficiency, ($\eta_{new,i}$). The parameter ~~n_y~~ $Ny_{,i,j}$ and μ_y ~~SS_y~~ will be sampled in a single survey with a random sample of households using the above described confidence/precision levels depending on annual or biennial monitoring frequency. Quantity of woody biomass used by project devices in tonnes per device $B_{y=1,new,i,\ survey}$ shall also be estimated through sampling within the first year of project installation. It can be coupled with $Ny_{,j,\ j}$ and μ_y for the first year. Of the three parameters to be monitored, two are proportion/percentage parameters (μ_y ~~SS_y~~ and $n_{y,i,j}$) and one is a mean value parameter ($\eta_{new,i}$).

[38] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

[39] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

In order to calculate the required sample size estimates, values for the proportions and the mean values are required. Furthermore, the standard deviation needs to be assumed in case of sampling for a mean value. As per Guidelines for Sampling and surveys for CDM project activities and programmes of activities, there are different ways available to obtain the estimates of the parameter of interest:

(a) Refer to the result of previous studies and use these results;
(b) In a situation where information from previous studies is not available, a preliminary sample as a pilot could be conducted and use that sample is used to provide the estimates;
(c) Use best guesses based on the researcher's own experiences.

For the registration/inclusion purpose of CPA-DD, option ~~C~~ (c) as stated above shall be applied. For the first monitoring period, the values from a pilot study shall be applied. For the following monitoring periods, the estimates shall be adjusted taken the results of the previous monitoring period(s) into account or the result from recent pilot study which is conducted after the previous monitoring periods.

To estimate the sample size for parameters ~~n_y~~ $Ny_{i,j}$ and μ_y ~~SS_y~~ the following equation[40] is used:

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

Where:

n	= Sample size
N	= Population size (Total number of households/ICS)
p	= Expected proportion
1.96	= Represents the 95% confidence required (In the case of 90% confidence, 1.645 shall be used)
0.1	= Represents the 10% relative precision

The following assumptions are made to exemplify the sample size calculation for parameters: $n_{y,j}$, ~~SS_y~~ μ_y and $\eta_{new,i}$.

1. An overview of the estimated sample sizes for a hypothetical population of 100,000 ICS units applying a level of 95/10 is provided below. It is likely that all the sample frames for each parameter will include fewer than 100,000 ICS in the first monitoring period, so this is a conservative approach. Hence, population size, N, is taken as 100,000 households/ICS (Assuming one ICS for one household).
2. It is expected at least 80% of ICS still in operation, hence the expected proportion *p* for ~~n_y~~ $Ny_{,j}$ is taken as 0.8.
3. ~~As per baseline study, it is reported that 60.8% of baseline stove still in use in Kaduna state and 51% of baseline stoves still in use in Kaduna and Kano states. As per Standard for sampling and surveys for CDM project activities and programme of activities, a proportion can describe either of the two possible scenarios of the success rate or the failure rate and project proponents may use the larger of the two proportions in the sample size calculation, which is *p* or (1−*p*). For conservative estimate of sample size, the sample size calculation is therefore based on anticipating continued use of 60.8%, which is the value of the larger proportion. Hence~~Based on past experience, the expected proportion *p* for ~~SS_y~~ μ_y is taken as 0.608.
4. The expected mean of ICS thermal efficiency is 0.38[41] and its standard deviation is assumed to be 20% of the overall thermal efficiency mean value which is 0.076.

[40] Equation 1 of Appendix 2, *Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 4)*

Sample size calculation:
The calculation of the required sample size for each parameter in the first monitoring period is illustrated below for a 95[42]/10 level of confidence and precision ~~(for biennial monitoring periods the sample sizes will be recalculated using 95/5 values)~~. In all cases a conservative approach is taken, however if for any parameter the required 95[43]/10 confidence/precision is not met then the CME will randomly select an additional sample and collect further data from this sample to ensure the pooled data meet or exceed the required thresholds.

Parameter ~~n_y~~ $Ny_{,i,j}$:
Based on the above assumptions, the resulting sampling size for a 95/10 confidence/precision is calculated as:

$$n \geq \frac{1.96^2 \times 100{,}000 \times 0.8(1-0.8)}{(100{,}000-1) \times 0.1^2 \times 0.8^2 + 1.96^2 \times 0.8(1-0.8)} = 95.95$$

Therefore, in this case a sample size of 96 is to be sampled from each primary sampling unit.

In case the resulting sample size to achieve the desired confidence/precision levels is smaller than 30 ICS, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion.

Parameter ~~SS~~ $\mu_{y\ y;}$

Based on the above assumptions, the sample size calculation for a 95/10 confidence/precision would be:

$$n \geq \frac{1.96^2 \times 100{,}000 \times 0.608(1-0.608)}{(100{,}000-1) \times 0.1^2 \times 0.608^2 + 1.96^2 \times 0.608(1-0.608)} = 247.07$$

The required sample size to be sampled from each Primary Sampling Unit is at least 248.

As in the case of parameter ~~n_y~~ $Ny_{,i}$, if the resulting sample size based on the above equation is smaller than 30 ICS, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion.

Parameter $\eta_{new,i}$:

For the purposes of determining sample size in the first monitoring period, the performance of ICS is characterized by the range of likely mean efficiency and the likely values of SD relative to the mean, according to the type of ICS. The ICS models that are manufactured in modern factories tend to be very highly efficient (30-50% thermal efficiency) and have been designed to meet stringent efficiency specifications so the standard deviation is expected to be relatively low.

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[41] 38% is the thermal efficiency (η_{new}) of the ICS used in the first CPA.

[42] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

[43] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

To estimate the sample size for parameter $\eta_{new,i}$ the following equation[44] is used:

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

Where:

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

n	= Sample size
N	= Population size (Total number of households/ICS)
mean	= Expected mean of ICS thermal efficiency
SD	= Expected standard deviation
1.96	= Represents the 95% confidence required (In the case of 90% confidence, 1.645 shall be used)
0.1	= Represents the 10% relative precision

Based on the above assumptions, the sample size calculation for a 95/10 confidence/precision would be

$$n \geq \frac{1.96^2 \times 100{,}000 \times \left(\frac{0.076}{0.38}\right)^2}{(100{,}000-1)\times 0.1^2 + 1.96^2 \times \left(\frac{0.076}{0.38}\right)^2} = 15.36$$

The resulting sample size based on the above equation is smaller than 30, since $\eta_{new,i}$ is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used as per paragraph ~~13~~ 14 of "Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version ~~05~~08.0.

The sample size for parameter $\eta_{new,i}$ under t-distribution is referred to the equation below[45]:

$$n = \left(\frac{t_{n-1} \times SD}{0.1 \times mean}\right)^2$$

Where t_{n-1} is the value of the t-distribution for 95[46]% confidence when the sample size is n. Since the sample size is not known yet, the first step is to use the value for 95[47]% confidence when the sample is large, i.e. 1.96 and then redefine the calculation.

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[44] Equation 4 of Appendix 2, *Guidelines for Sampling and Surveys in CDM Project Activities and Programme of Activities* (version 04.0)

[45] Equation 38,*Guidelines for Sampling and Surveys in CDM Project Activities and Programme of Activities* (version 04.0)

[46] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

[47] For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

$$n = \left(\frac{1.96 \times 0.076}{0.1 \times 0.38} \right)^2 = 15.37$$

Thus n is rounded up to 16.
The calculation now need to repeat using t-value for 95% confidence and n = 16

$$n = \left(\frac{2.131 \times 0.076}{0.1 \times 0.38} \right)^2 = 18.17$$

And n is rounded to 19.

The calculation now need to repeat using t_{n-1} value for n = 19. The process should be iterated until there is no change to the value of n.

t_{19-1}	2.101
n=	17.66
Round up	18

t_{18-1}	2.110
n=	17.81
Round up	18

The repeated calculation shows that n = 18. Thus the sample size to be sampled from each sampling unit is 18.

The sampling for parameter $\eta_{new,i}$ shall comprise of ICS installed/distributed during the current vintage and oldest vintage. The annual efficiency loss of ICS established from these two vintages may be used to correct the initial efficiency of the ICS installed/distributed later on.

Sample size estimation of 'Quantity of woody biomass used by project devices in tonnes per device' ($B_{y=1,new,i,\ survey}$) shall be included in the CPA DD depending on choice of option for estimation of $B_{y,\ savings}$
The CME may choose to use the same samples to monitor more than one parameter. For instance, the CME can sample ~~SS_y~~ μ_y, ~~n_y~~ $Ny_{i,j}$, $B_{y=1,new,i,\ survey}$ and $\eta_{new,i}$ ~~new, i~~ –or a combination of these parameters- in the same samples. Since parameters ~~n_y~~ Ny_j ~~and~~ μ_y and $B_{y=1,new,i,\ survey}$ ~~SS_y~~ ~~sharing~~ share the same sampling units, CME may choose to have one common survey for these ~~two~~ three parameters with largest number of sample size between these ~~two~~ three parameters ~~is~~ being chosen, then a separate sampling effort may be arranged for parameter $\eta_{new,i}$. Sampling more than one parameter within the same sample (household) helps reduce travel needs for monitoring and the associated costs. At the same time this approach ensures the random selection of samples for every parameter.

Oversampling is strongly encouraged, not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not ~~achieved~~achieved, and additional sampling efforts would be required. The sample size shown above will be adjusted upwards to account for non-responses, CME shall determine the appropriate non-responses rate based on previous experience.

(b) Data:

(i) Field Measurements:

To monitor the number of stoves that continue to be in use (~~n_y~~$N_{y,i,j}$) and the percentage of continued baseline stove use among ICS households in the database (~~SS_y~~μ_y), the data collected will be a representative number of stoves in the database that are in use for the monitoring period. ~~The scope is a representative sample of stoves only across CPAs with the same CPA Implementer and same ICS model in this SSC-PoA.~~ The method of collecting data will be field surveys of required sample size of ICS users in the database. Frequency of data collection is one survey per monitoring period. Data will be collected from the field surveys, entered in the database and included in the monitoring report.

For monitoring $B_{y=1,new,i,\ survey}$, the data collected will be representative number of stoves in the database that were distributed within one year of start date of CPA implementation. The method of collecting data will be field survey and frequency will be once during the entire crediting period.

To monitor the efficiency of the stove ~~at least every two years~~annually ~~-~~(as required by the AMS II.G version ~~3~~ 11 methodology) a new test will be conducted to determine the rate at which a sample of stoves from a given vintage year deteriorate in efficiency. The test method to collect the efficiency data will be the Water Boiling Test.

The table below summarizes field measurement data requirements

Parameter	Timing (indicative)	Frequency (required by AMS II.G – Version ~~3~~11)	Methods to be applied	Comments on seasonal fluctuation
~~n_y~~$N_{y,i,j}$	Monitoring will likely occur every 12 months	~~No less frequently than every two years~~annual/biennial	Visits to the premises, visual inspection and interview with ICS end-user	Unlikely to be due to any seasonal fluctuation.
~~SS_y~~μ_y	Monitoring will likely occur every 12 months	~~No less frequently than every two years~~ annual/biennial	Visits to the premises, visual inspection and interview with ICS end-user.	Unlikely to be due to any seasonal fluctuation.
$\eta_{~~new,i~~new,\ i}$	Monitoring will likely occur every 12 months, but will include ICS of "new vintage[48] as well as the oldest vintage in the sampling frame (sample allocated proportional to size)	~~No less frequently than every two years~~annually	Water Boiling Test (WBT) Protocol ~~Version 3.0 (or more recent at the discretion of the CME).~~	Not due to any seasonal fluctuation.
$B_{y=1,new,i,\ survey}$	Within 1st year from the starting date of CPA implementation for CPAs applying equation 8 of applied methodology.	Once. The value will be fixed for entire crediting period	Visits to the premises, visual inspection, measurement and interview with ICS end-user.	unlikely

[48] Vintage shall be defined as the "age" of the ICS – ie. number of years it has been in operation.

(ii)Quality Assurance/Quality Control

The CME will apply measures to ensure the required confidence/precision for each sampled parameter is met, allowing for non-response and the possible removal of outliers from the sample, as part of a Quality Control/Quality Assurance system. The choice of measure applied to each parameter will depend on the cost of each data collection approach and logistics required. The CME will determine the most effective measure for each parameter from the following list (illustrated using a required sample size of 20 and an effect of non-response of 2 to 4 ICS):

- Oversampling: Randomly draw a sample of minimum 24 ICS and collect data from each
- Buffer Group: Randomly draw a sample of at minimum 24 ICS and collect data from only 22 ICS. If this would not result in the required sample size data would be collected from the additional 2 ICS that were selected in the sample.
- Draw an additional sample: Randomly draw a sample of 22 ICS and collect data from these. If the required sample size is not achieved, an additional sample of 2 elements will be drawn and included in the sample.
- Use lower confidence bound (of ~~n_y~~ $Ny_{,i,j,}$ $B_{y=1,new,i,\ survey}$ ~~–~~or $\eta_{new,i}$) or, with a conservative approach according to the parameter definitions, the upper confidence bound of ~~SS_y~~ μ_y

The CME may choose to stop monitoring a particular parameter once the required level of confidence/precision has been reached, as long as the calculated minimum number of samples has been achieved. As an example, the following steps could logically be followed for the case of applying a 30% buffer:
1. Visit first 10% of premises required for the 30% buffer. If the number of responses is sufficient to achieve the required reliability level, then stop sampling.
2. If step 1 is not sufficient to achieve the required reliability level, then visit the next 10% of premises (increases the additional sampling to 20% of the 30% buffer). If this additional sampling is sufficient, then stop sampling.
3. If step 2 is not sufficient to achieve the required reliability level, then complete the final 10% of the additional sampling buffer (bringing the total to 30%).

The sampling plan has the following procedures in place to ensure good quality data. The CME will ensure that field personnel have reviewed, understand and have signed the monitoring plan, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. A quality control and assurance strategy will be documented. Quality control and assurance strategies include addressing non-sampling errors, such as non-response or bias from interviewer. The monitoring plan will explain how to properly survey households to prevent bias from interviewer. In the case a household refuses to participate, another household will be chosen at random. To reduce interviewer bias, good questionnaire design and well-tested questionnaires will be used.

The calculation of the sample size will be carried out using estimates for parameter proportions, mean values and standard deviations, as the actual characteristics of the population/sampling frame are unknown. In order to ensure the quality of the sampling results, the CME can draw on the provisions for reliability calculations as provided by the *Guidelines for Sampling and Surveys in CDM Project Activities and Programme of Activities* (~~EB 86, Annex 4~~version 04). In the event that the sampling results do not fulfil the required level of confidence and precision, the CME can undertake additional samples. If the reliability is still not sufficient after additional samples or other measures, the sampling may be repeated with an increased sample size. Alternatively, the CME may choose to apply the lower bound ~~(~~or higher bound according to the more conservative approach~~, as for example in the proportion of end-users who continue to use a baseline stove, SS_y) of the sampling results as is allowed for by the methodology (AMS II.G v3, paragraph 22).~~.

~~-~~As the continued use of ICS and the incidence of baseline stove usage among ICS users are binary parameters, there can be no outliers in the sampled data and no treatment for outliers is required. The sample data for $\eta_{new,i}$ is continuous and therefore the presence of outliers is possible. The following approach will be used to identify and address outliers for the parameter $\eta_{new,i}$.

Outliers for parameter η_{new} will be defined as those data points with values greater than three standard deviations from the mean of the sample.

Data points identified as outliers according to the above analysis will be examined further to correct for possible transcription and data entry ~~errors, but~~errors but will be omitted from the analysis if no such administrative errors exist.

(i) Data archiving

Hard copies of the surveys will be kept and the registration database will have back up. Original stove purchase contracts (SMS data and/or paper registration card or equivalent) or other means of acceptance by the users will be stored in the main office for the coordinating entity. A back-up of the registration database will also be stored on an electronic medium by the CME. All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever is later.

(ii) Analysis

The CME will manage a project database that includes the following data that can be directly attributable to each CPA within the SSC-PoA, thereby allowing unambiguous determination of the emission reductions attributable to each CPA:

- A list of households participating in each CPA, including name, community/location, distribution date and unique serial number;
- Testing to ensure that the stoves are still operating above the minimum 20% efficiency required by the AMS II.G (version ~~3~~11) methodology, by the CPA Implementer, CME or a third party certified by a national standards body or an appropriate certifying agency recognized by it.
- Where replacements are made, assurance that the efficiency of the new ICS is similar to the specified.

Data obtained from the samples will be used to estimate proportions and mean values for the parameters described above. The values will then be factored into the emissions reduction calculations and result in the request for issuance of CERs for that group of CPAs – the primary sampling Units. The parameters are applied for emission reduction calculations as outlined in Part II ~~B~~I.6.3 of the SSC-PoA-DD. The stoves that are not in use will be excluded from emissions reductions calculations and will not be counted towards the total number of ICS in operation during the monitoring period. The thermal efficiency of new stoves ($\eta_{new,i}$) will be used in the calculation of the per stove emission reduction, which will be multiplied by the number of stoves in operation in the CPA to obtain the emission reductions per CPA.

(c)Implementation

Sampling for the purpose of emission reduction calculation and elaboration of the monitoring report will occur at the end of each monitoring period. This sampling will be conducted by trained personal either part of the CPA Implementer or CME team, or an experienced third party entity. The maximum length of one monitoring period will be two years (duration, not calendar years), as AMS II.G., version ~~3,~~11 provides the option for annual or biennial (every two years) monitoring. The CPA Implementer will be responsible for managing household data collection and entry into the project database. Field personnel will receive training on how to properly deal with surveying techniques and reduce errors and sign a document certifying that there is no conflict of interest of those involved in data collection and analysis. If there is conflict of interest, the personnel will not be allowed to participate in data collection and analysis. The project database will record the start and end dates of each monitoring period, and record the emission reductions attributable to each monitoring period. Appropriate record keeping procedures will be implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding CPA, preventing any occurrences of double counting. An internal review of the project database will be able to determine the current status of each SSC-CPA—the duration of previous monitoring periods, the households delivering monitoring data, and current verification activities.

Assessment for Leakage

According to methodology II.G, version ~~3~~11, Paragraph 39; leakage related to the non-renewable woody biomass saved by the project activity shall be assessed on *ex-post* surveys of users and the areas from which the woody biomass is sourced. The methodology offers the alternative that if B_{old} is multiplied a net to gross adjustment factor of 0.95 to account for leakages, surveys are not required. This SSC-PoA will use the 0.95 leakage adjustment factor instead of *ex-post* surveys.

~~The other source of leakage occurs if equipment currently being utilised is transferred from outside the boundary to the project activity. All ICS in the SSC-PoA will be newly manufactured/assembled. Where second-hand/used ICS are distributed to an end-user the ICS will be from within the project (ie previously newly manufactured/assembled and either a demonstration model or transferred from one end-user within the project to another new or existing end-user). In both of these cases there will no equipment (ICS) being utilized outside the project area (any project non-participant) that is transferred to the project area (included as an ICS in the database) so leakage defined in paragraph 14 of the AMS II.G (version 3) methodology is not considered. Where second-hand/used ICS are transferred within the project area (between end-user project participants) the database will be updated to reflect this change to ensure there is no double counting of ICS.~~

Disposal of Low Efficiency Appliances and Use of Baseline Stoves

In line with equation 2 of the applied methodology, CPAs using equation 7 are required to determine whether pre-project devices are still in use along with project ICS and if found so, an adjustment factor 'μ_y' to account for use of wood in pre-project devices needs to be applied to emission reduction- $ER_{y,i,j}$ calculation. ~~When an ICS is distributed the end user receives information explaining that the conventional open fire appliance must no longer be used. Follow-up meetings with end users will ensure that those who have received an ICS are using it properly and that the conventional open fire is no longer in use. As per methodological condition 20 (b), if it is determined that the conventional open fire is still in use and the ICS is also in use, the wood used in conventional open fire will be subtracted from B_{old}.~~ The number of households continuing to use a baseline stove in addition to their ICS ~~(SS_y)~~, will be monitored throughout the project lifetime using sampling approach described above. ~~This will be achieved using a single sample for in-use appliances ($n_{y,i}$) described above, and will meet EB86 Annex 3 confidence/precision requirements.~~

Monitoring Reporting

The CME will assess all monitoring data and produce one or two monitoring reports for the PoA for the DOE to verify corresponding to the preceding monitoring period of all CPAs. This report will present the data relating to the emission reductions generated by those CPAs included in the SSC-PoA at the time of the monitoring period.

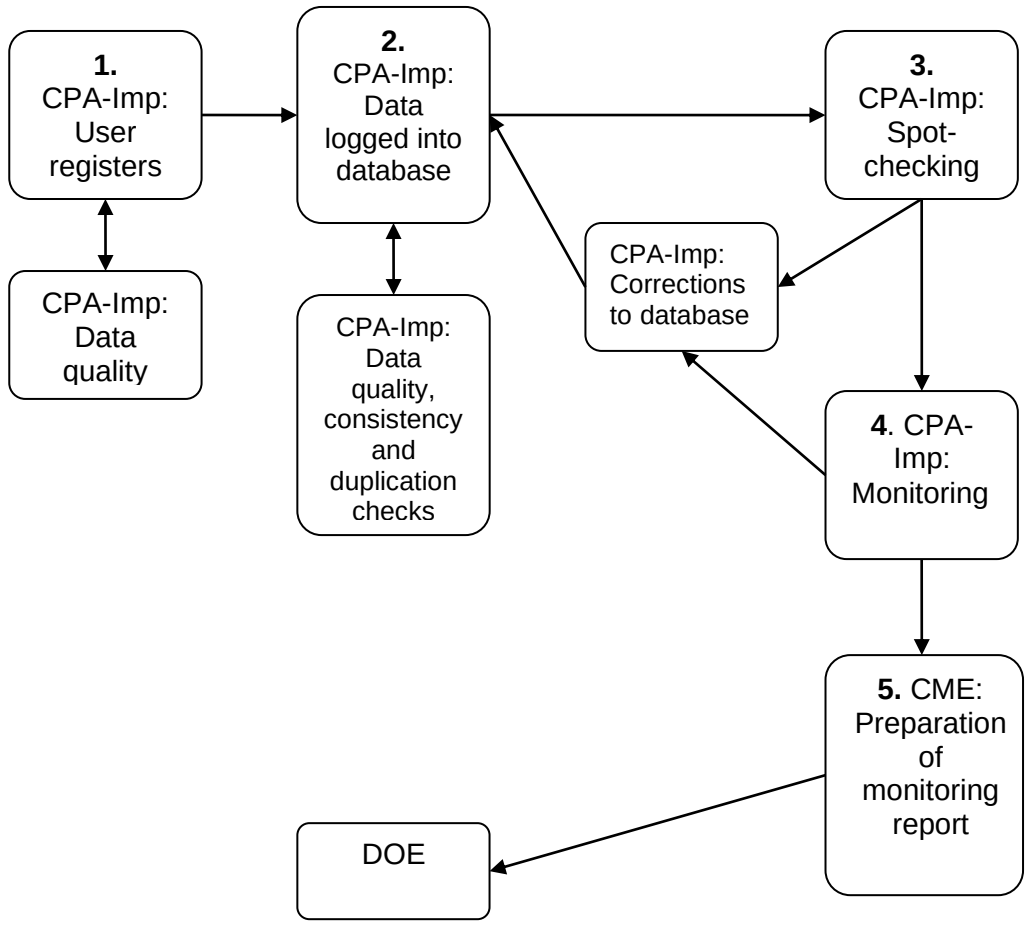
I.7.3. Other elements of monitoring plan

>>

The Monitoring Plan applied in this SSC-PoA involves a number of key elements that ensure that the CME and CPA-Implementer have high-quality, unbiased and reliable information regarding the performance of the project in terms of implementation and outcomes, and for the purposes of calculating Certified Emission Reductions (CERs) following AMS II.G version ~~3~~11.0 on the basis of the mass of non-renewable biomass saved by the ICS in the project activity.

- Data collection procedures
- Distribution and Monitoring Database
- Spot Checking of ICS (ongoing)
- Sample Plan for the Monitoring Survey
- Data Quality, Consistency and Duplication Checks
- Monitoring Reporting

The below flow-chart illustrates the roles and responsibilities of the parties during the implementation of the monitoring plan for the SSC-CPA. In the below flowchart, the CPA Implementer is abbreviated to “CPA-Imp”, and can be the CME or another party authorized by the CME.



Below is the description of the above steps on the flow-chart.

1. **CPA-Imp: User registers stove:** CPA Implementer will collect/receive the necessary information requested on the Registration Card from the user. Means of collecting this information may be through a physical Registration Card filled by CPA-Imp staff, retailers, end-users or partner organization’s staff, or through the use of ICTs or SMS. CPA Implementers’ staff shall double check the accuracy of information provided, and request for field staff additional clarifications if needed;
2. **CPA-Imp: Data logged into database:** CPA Implementer trained staff will input the data in the database either manually (if data collected from physical Registration Card) or this will be automatically input if data was collected using ICTs or SMS. CPA Implementer staff shall double check the information included on the database and check for duplications. Any duplicate information shall be investigated and errors corrected or excluded from the database if it is a true duplicate entry.
3. **CPA-Imp: Spot- checking (ongoing):** CPA Implementer field staff will continually randomly select households included in the database and visit them to cross-check the information on the database with the factual evidence in the field. Any inconsistencies found (eg. change in the address of a user) will be updated on the ~~database ,~~database, and

in the case ICS are found to be no longer in use, they will be clearly marked as such and excluded from emission reductions calculations.

4. **CPA-Imp: Monitoring:** CPA Implementer will follow the requirements as per SSC-POA-DD to collect the necessary information for a monitoring report.
5. **CME: Preparation of monitoring report:** the CPA Implementers or the CME will prepare the final monitoring report to be provided to the verifier DOE for verification of emission reductions. A copy of the monitoring report will remain with the CME

The CME will coordinate and manage each CPA Implementer and assist them in implementing each element of the monitoring plan. The monitoring plan shall be elaborated per CPA an in accordance with the Sampling Plan ~~below~~in I.7.2 above.

SECTION J. Crediting period type and duration

>>
Fixed.
10 years 00 months

SECTION K. Eligibility criteria for inclusion of CPAs

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No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1.	PoA specific requirement	Involve the promotion and distribution of ICS by CQC or entities approved and authorised by CQC.	A clear description of which entity is distributing ICS and model of ICS shall be given on the CPA-DD. If it is an entity approved by CQC, a letter from CQC acknowledging its participation or the agreement between CQC and the entity (covering its participation on the SSC-POA) shall suffice as evidence for this eligibility criterion.
2.	Geographical Boundary	Is ~~I~~implemented within the geographical boundary ~~of Kaduna State and/or Kano State,~~ Nigeria;	~~In order to use the baseline fuel surveys that accompany this SSC-PoA, the~~The CME/ ~~and~~ CPA Implementer shall self-declare that the stoves will only be sold within the geographic confines of ~~either Kaduna and/or Kano States,~~ Nigeria. This self-declaration shall be provided to DOE at the time of inclusion of the CPA.

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
3.	Small Scale threshold	1. If the CPA consists of units which qualify as microscale CDM units, compliance of the CPA with small scale threshold throughout the crediting period is not required as referenced from paragraph 124 (m) of CDM standard for programme of activities; version 02.0 2. For small scale CPAs not conforming to paragraphs 12 (a) or (b) of Tool 19, demonstration of adherence to small scale threshold to be carried out in accordance with paragraph 124 (m) of PS for PoA.	Calculation of annual energy saving for individual ICS to be submitted to DOE in case of option 1 and aggregate energy saving of CPA in case of option 2.

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
~~3.~~4.	Additionality	Each CPA will satisfy the criteria for demonstrating additionality by establishing that it is implemented in rural Nigeria and comprises of distributed units with an energy saving limit of <= 60 GWh_{th}/yr and end users are households/communities. For small scale CPAs not conforming to paragraphs 12 (a) or (b) of Tool 19, additionality to be demonstrated through figure 2 of Tool 19.~~Have a maximum energy saving of 180 GWh_{th}/year[49] throughout the CPA's crediting period, and the energy savings of each ICS unit in a CPA is no larger than 5% [or 9000 MWh_{th}/yr] of the small-scale CDM threshold of 180 GWh_{th}/yr in order to demonstrate additionality of each CPA;~~	For demonstrating that the CPA is implemented in rural area, the CME/CPA implementer shall use publicly available/official data/survey. Energy saving calculation and self-declaration by CME/CPA implementer regarding target end users to be submitted to validating DOE. ~~CME and CPA Implementer shall provide calculations that determine (1) the maximum number of ICS which are going to be implemented in the CPA and (2) the energy savings per unit of ICS.~~ ~~Together, the ICS in each CPA shall save equal or less than 180 GWh_{th}/year. Energy saving is estimated by taking the estimated biomass saved per stove in tonnes and multiplying that by the net calorific value of the wood (0.015 TJ/tonne converted from TJ to kWh, which is equivalent to 4,167 kWh/tonne of wood saved). The energy savings per stove is then multiplied by the number of stoves in the CPA to determine the maximum number of stoves that can be included without exceeding the 180 GWh_{th}/year limit.~~ ~~The energy savings of each ICS unit shall not exceed energy savings of 9000 MWh_{th}/yr, which is 5% of the small-scale CDM threshold of 180 GWh_{th}/yr energy savings. With the baseline survey data for Kaduna and Kano States, an example stove is estimated to save about 0.0157 GWh_{th}/yr, far below the 9000 MWh_{th}/yr threshold. With the baseline survey data for Kaduna State, each stove is estimated to save about 0.0129 GWh_{th}/yr, also far below the 9000 MWh_{th}/yr threshold.~~

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
~~4.~~5.	Double Counting check	Has a database describing uniquely identified and defined households in which ICS have been distributed;	A CPA will have a database that includes the following for each ICS unit: name of the customer, address/ description of location, contact telephone number(s), unique serial number of the stove (including prefacing the serial number with the letters "CQC" or three letters representing the stove model), retailer ID, and date of purchase. ~~The~~ Sample of database shall be made available to the DOE at time of inclusion.
~~5.~~6.	Compliance with applicability of methodology	Conditions to ensure compliance with the applicability of the applied methodologies, and other regulatory documents. ~~.Comply with the PoA standard Para 14 (e) the eligibility criteria should be the criteria with regard to the *conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPA*.~~ The CPA should comply with all criteria. These applicability criteria include: (1) the project involves the distribution of energy efficient cooking stoves; (2) these new stoves have an efficiency of no less than 20%; (3) non-renewable biomass has been used as a fuel since 1989~~.~~(4) proposed method of distribution (5) define steps to ensure that double counting does not occur.	Project participants must show evidence of compliance with these eligibility criteria. This would include (1) a description and technical specifications of the improve stove models to be included in the project; (2) the results of a water boiling test indicating that the ICS implemented under the CPA has an efficiency of no less than 20%; and (3) an NRB analysis citing relevant literature showing that non-renewable biomass has been used since Dec. 1989.(4) self- declaration letter enumerating the method of stove distribution and (5) carry out double counting check as stated in eligibility criteria no 4 & 9.

~~[49] As per Annex 27 of the 68th meeting of the CDM Executive Board, GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES (version 9), projects are considered additional if "project activities are solely comprised of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small scale thresholds. Annex 21 of EB 61 established 60GWh per year as the SSC threshold. The conversion from 60 GWh_e to 180 GWh_{th} per year was approved in a clarification by the small-scale working group (SSC_233). Footnote 1 of Annex 27 of EB 68 clarifies that the size of each unit (ICS) has to be below 3000 MWh of energy saving per year, equivalent to 9000 MWh_{th}/year. Thus, if the CPA complies with eligibility criterion 3, the CPA is considered additional.~~

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
~~6.~~7.	Exclusivity clause	Does not involve households already involved or covered by any other CPA or CDM project involving the distribution of ICS	Each ICS in each SSC-CPA included in this SSC-PoA will be identified by a unique combination of customer name and geographical location, as well as a unique serial number. The serial number will allow for a clear distinction between the stoves from this SSC-PoA with those of other potential SSC-PoAs. No individual serial number can be in more than one CPA, so it will not be possible for one stove to be counted in two different CPAs. In addition, each CPA will be cross-checked with other CPAs in this SSC-PoA and with CPAs in any other SSC-PoA or in a CDM project activity operating in the country using the UNFCCC, the Gold Standard (GS), and other relevant voluntary schemes to ensure that the CPA is not included in any other SSC-PoA, CDM project activity or voluntary project activity. CPA Implementer or CME will review all on-line materials that might be available from the UNFCCC and GS websites, which list every SSC-PoA, CPA and single-project activity to ensure no other projects are covering the households included in this CPA. When possible, the CPA Implementer will try and obtain access to other project developers' databases to cross-check and ensure there is no overlap of households. Given that each stove in this SSC-PoA will have a serial number beginning with "CQC" or three letters representing the stove model, it is extremely unlikely there will be any overlap. All of this information will be summarized in a report and provided to the DOE upon verification.

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
~~7.~~8.	CPA start date	Be able to provide documentary evidence of the start date.	The start date of the CPA will be when the first stove is sold and registered in the database -- this evidence can be provided to the DOE. Specifically, the registration card or SMS text/ ICT will have the date of purchase, and the DOE can review the database to confirm the earliest date of a sale of a stove.
~~8.~~9.	Diversion of ODA fund	Be able to affirm that no funding is coming from Annex I parties. If any public funding is made available from Annex I parties, affirm there is no diversion of Official Development Assistance (ODA);	Self-declaration letters from the CME shall be provided to the validator at time of inclusion asserting that no funding is coming from Annex I parties. If there is funding from an Annex I party, there must be a letter from the funding organization stating that the funding is not a diversion of ODA. If possible, supporting data will be provided to support this assertion, such as the budget for the CPA (stove purchases, marketing/distribution costs) and the amount of financing coming from a private source.
~~9.~~10.	Double counting check	Is not registered as an individual CDM project activity nor included in another registered SSC-PoA	The CME shall cross-check the CPA with other CPAs in this SSC-PoA and with CPAs in any other SSC-PoA or in a CDM project activity operating in the country using the UNFCCC, the Gold Standard, and other relevant voluntary schemes to ensure that the CPA is not included in any other SSC-PoA, CDM project activity or voluntary project activity. All of this information will be summarized in a report and provided to the DOE upon verification.
~~10.~~11.	PoA related requirement	Is approved by CQC entity prior to its incorporation into the SSC-PoA.	CQC shall confirm (through a letter to the DOE at time of inclusion) that it has approved the incorporation of the CPA into the SSC-POA.
12.	Local stakeholder consultation & environmental analysis	The Local Stakeholder Consultation has been conducted at PoA Level and the EIA process is also performed at PoA level.	CPAs to be included in the present PoA are not required to conduct LSC or environmental analysis as these have been done at PoA level.

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
~~11.~~13.	Technology	Is introducing ICS that will have a thermal efficiency of no less than 20%, (using the WBT outlined in AMS IIG. Version ~~3~~ 11 approved by the CDM Executive). Efficiency of the ICS shall be established by a national standards body or an appropriate certifying agent recognized by it, or alternatively manufacturers' specification shall be used	~~This~~ The model of stove implemented under the CPA shall demonstrate its efficiency according to the Water Boiling Test – as per AMS II.G. ~~v03~~v11. The CPA is using a stove technology, whose manufacturer specifications are confirmed using a Water Boiling Test.
14.	Target group	The target group should be defined clearly in the CPA and should be households or communities.	Declaration by CME/CPA implementer to be submitted to validating DOE.
15.	Sampling	CPAs shall use Standard for sampling and surveys for project activities and programme of activities, version 08; for surveys	Sample size calculation to be submitted to verifying DOE.
~~12.~~16.	De-bundling check	1. As the generic CPA consists of units which qualify as microscale CDM units, CPAs developed under the present PoA are exempted from performing de-bundling check, as referenced from paragraph 124 (n) of CDM standard for programme of activities; version 02.0. ~~1.~~2. For small scale CPAs not conforming to paragraphs 12 (a) or (b) of Tool 19, ~~Ensure~~ it should be demonstrated that the CPA meets the criteria for not being a de-bundled component of a larger project activity (eg: the debundling rule does not apply if the stove, the independent subsystem, does not exceed 1% of the 180 GWh)	Calculation of annual energy saving for individual ICS to be submitted to DOE.~~Calculations show that each stove saves a fraction of a GWH per year. Separate Excel spreadsheet shall be provided to the DOE at time of inclusion. With the baseline survey data for Kaduna and Kano States, an example stove is estimated to save about 0.0157 GWh_{th}/yr, 0.009% of 180 GWh_{th}/yr. With the baseline survey data for Kaduna State, each stove is estimated to save about 0.0129 GWh_{th}/yr, also far below the 9000 MWh_{th}/yr threshold.~~
~~13.~~17.	CER Ownership rights	CPAs must include a mechanism that transfers the ownership rights of CERs from the ICS user to the project participants.	The CPA requires that a warranty card is signed or accepted by the end-user upon purchase or distribution of the stove that states that the PPs have ownership of the carbon assets for the life of the stove.

Appendix 1. Contact information of coordinating/managing entity and project participants

Coordinating/managing entity and/or project participants	☒ Coordinating/managing entity ☒ Project participant
Organization name	C-Quest Capital LLC
Country	USA
Address	1211 Connecticut Ave NW, Suite 800, Washington DC 20036
Telephone	+1 (202) 416 2410
Fax	+1 (202) 416 2499
E-mail	cqc-operations@cquestcapital.com
Website	www.cquestcapital.com
Contact person	Isabel Alegre

Coordinating/managing entity and/or project participants	☐ Coordinating/managing entity ☒ Project participant
Organization name	Swedish Energy Agency
Country	Sweden
Address	PO Box 310, 631 04 Eskilstuna, Sweden
Telephone	+46 16 544 20 00
Fax	+46 16 544 20 99
E-mail	-
Website	http://www.energimyndigheten.se/en/
Contact person	Maria Gustavsson

Appendix 2. Affirmation regarding public funding

No public funding is expected to be made available for the proposed SSC-PoA, or any CPA under the proposed SSC-PoA. If any public funding occurs, it is ensured there is no diversion of Official Development Assistance (ODA).

Appendix 3. Applicability of methodologies and standardized baselines

Non-renewable biomass (NRB) assessment

The UNFCCC methodology defines demonstrably renewable biomass (DRB) as (paraphrased) that which:

1. Originates from forests which remain forests, where sustainable management practices are in place and followed, and where national forestry and conservation measures are followed.

2. Originates from non-forest areas which remain as non-forest or become forest, where sustainable management practices are in place and followed, and where national forestry and conservation measures are allowed.

Non-renewable biomass (NRB) is described as the total biomass used at baseline, minus DRB, providing at least two of the following indicators of non-renewability are in place:

1. A trend showing an increase in time spent or distance travelled for gathering fuelwood, by users (or fuelwood suppliers) or alternatively, a trend showing an increase in the distance the fuelwood is transported to the project area;

2. 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;

3. Increasing trends in fuelwood prices indicating a scarcity of fuelwood;

4. Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass.

~~In turn, we see that there is little *evidence of demonstrably renewable biomass* in the Kaduna State which lies in the center of the Guinea Savannah ecological region of Nigeria.~~

Supporting evidence is the trend in loss of forest from 1990 to 2010. The Global Forest Resources Assessment 2010[50] (FAO) indicates that total forest area declined by 48% from 1990 to 2010, as summarized in the following table.

Trends in extent of forest 1990-2010

	Forest area (1 000 ha)				Annual change rate					
					1990-2000		2000-2005		2005-2010	
Country/area	1990	2000	2005	2010	1 000 ha/yr	%[a]	1 000 ha/yr	%[a]	1 000 ha/yr	%[a]
Nigeria	17234	13137	11089	9041	-410	-2.68	-410	-3.33	-410	-4.00

In relation to this forest loss over time, the trend in carbon stock in living forest biomass has also reduced by approximately 46% over the 1990 to 2010 time period as summarized in the following table[51].

Trends in carbon stock in living forest biomass 1990-2010

	Carbon stock in living forest biomass (million tonnes)					Annual change (million tonnes/yr)			Annual change per hectare (t/ha/yr)		
Country/ area	1990	2000	2005	2010	Per hectare 2010 (tonnes)	1990-2000	2000-2005	2005-2010	1990-2000	2000-2005	2005-2010
Nigeria	2016	1550	1317	1085	120	-47	-47	-46	n.s.	n.s.	n.s.

We see strong evidence that much of the biomass used in the Guinea Savannah region of Nigeria is *derived from non-renewable sources*.

1. There is considerable evidence that there is a strong trend towards increased distance travelled by fuelwood dealers. Hyman[52] reports that demand outstripped supply across the country and that the deficit is met through long-distance transportation of fuelwood.
2. FAO 2003[53] presents data on demand and supply of biomass within the Guinea and Sudan Savannah regions of Nigeria. Its data indicate a combined deficit of 38.9 million m^3

[50] http://www.fao.org/forestry/fra/fra2010/en/ GLOBAL TABLES, Table 3

[51] http://www.fao.org/forestry/fra/fra2010/en/ GLOBAL TABLES, Table 11

[52] Hyman, E. 1994. Fuel substitution and efficient woodstoves: Are they the answers to the fuelwood supply problem in Northern Nigeria? *Environmental Management* 18, no. 1. http://www.springerlink.com/content/4q86106135738360/

firewood. Of total demand within these areas, only 17% is met by supply. These data are presented in the following table.

Comparison of production and demand of fuelwood in Nigeria. ('000m^3) (FAO 2003)

Ecological zones	1994	1995	2000	2005	2010
A. Production					
Guinea Savannah	7,861	7,635	6,500	6,149	5,797
Sudan Savannah	3,163	3,267	2,767	2,748	2,359
Total production	**11,024**	**10,902**	**9,267**	**8,897**	**8,156**
B. Demand					
Guinea Savannah	22,464	22,808	25,033	26,271	26,417
Sudan Savannah	16,054	17,054	19,577	20,118	20,660
Total demand	**38,518**	**39,862**	**44,610**	**46,389**	**47,077**
Summary					
Net deficit (B – A)	**-27,494**	**-28,960**	**-35,343**	**-37,492**	**-38,921**
NRB % (= 100*(B-A/B)	**71**	**73**	**79**	**81**	**83**

Woodfuel collection in both the forest and savanna regions has been described scientific journals as "unsustainable"[54] and this sentiment is also reflected in the National Energy Policy of Nigeria, which notes that demand for woodfuel is unsustainable and significantly greater than annual woodfuel supply.

It is unlikely that trends in loss of carbon stocks and the time it takes to collect firewood are influenced by enforcement of rules and regulations, given the widespread challenges to implementing forestry laws in Nigeria. On the contrary, the lack of enforcement of forestry management has exacerbated widespread depletion of forest resources across Nigeria[55]. The Federal Ministry of Environment sets national policies, but responsibility for the implementation of forest management lies with each of the country's 36 states, each of which has its own forestry laws guided by those at federal level. At the state level, management capacity of the state forestry departments and local organizations is mostly low, with poor funding, low staff morale, limited technical training and often high levels of government corruption. Across the board at the state level, forest laws are often obsolete, and weakly enforced[56]. Management strategies are generally considered insufficient to maintain forest cover and conserve biodiversity[57, 58, 59, 60].

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[53] FAO. 2003. Experience of Implementing National Forest Programmes in NIGERIA. EC-FAO PARTNERSHIP PROGRAMME (2000-2003), p42.

[54] Gbadegesin, A. and Olorunfemi, F. (2011) Socio-economic aspects of fuelwood business in the Forest and Savanna Zones of Nigeria: Implications for Forest Sustainability and Adaptation to Climate Change. Global Journal of Human Social Science 11(1). PAGE 55

[55] Chemonics International. (2008) Nigeria Biodiversity and Tropical Forestry Assessment: Maximising Agricultural Revenue in Key Enterprises for Targeted Sites (Markets). Available from: http://pdf.usaid.gov/pdf_docs/PNADN536.pdf. PAGE 37

[56] National Programme Document- Nigeria. Available on the UN-REDD website at: http://www.un-redd.org/PolicyBoard/7thPolicyBoard/tabid/54129/Default.aspx PAGE 22

[57] Chemonics International. (2008) Nigeria Biodiversity and Tropical Forestry Assessment: Maximising Agricultural Revenue in Key Enterprises for Targeted Sites (Markets). Available from: http://pdf.usaid.gov/pdf_docs/PNADN536.pdf. PAGE 37

[58] Aruofor, R. (2001) Forestry outlook study for Africa: Nigeria. Food and Agriculture Organisation of the United Nations. Available from: http://www.fao.org/DOCREP/004/AB592E/AB592E00.htm#TOC. Section "Forestry policy, legislation and institutions"

Therefore it is highly unlikely that enforcement of regulations is causing collection further away from areas where villagers would collect in the absence of any such regulations. Rather, collection from further distances is a result of deforestation.

The above provides evidence that forested areas (including those with protected status) are vulnerable to encroachment; that traditional supplies of firewood around cities have been depleted; that demand for firewood continues to grow and exceed supply by a factor of 4; that wood is transported many hundreds of kilometres within Nigeria; that prices have increased in recent years; and that there is a net reduction in forested and wooded areas across Nigeria and that this is particularly pronounced within the project area.

Together, this may be used to conclude that 100% of fire wood consumed in the project area is from non-renewable sources.

~~To be conservative, the fraction of non-renewable biomass (f_{NRB}) has been calculated in accordance with the approach presented in the Information Note "Default values of fraction of non-renewable biomass for least developed countries and small-island developing states, version 01.0 (EB 67 Annex 22)[61], resulting in a national level *fNRB* value of 0.93.~~

~~The fraction of non-renewable biomass (f_{NRB}), in %, is calculated from the equation below:~~

$$fNRB = \frac{NRB}{NRB + DRB} \quad (1)$$

~~Where,~~

~~*NRB*~~	~~Non-renewable biomass (t/yr)~~
~~*DRB*~~	~~Demonstrably renewable biomass (t/yr)~~

~~The Total Annual Biomass Removals (R) from Nigeria has been calculated as a proxy for the quantity of woody biomass used in the absence of the project activity (B_y) and estimating the proportion of R that is demonstrably renewable (DRB) and non-renewable (NRB) using equations below:~~

~~NRB = R – DRB (2)~~
~~*Where,*~~

~~R *Total annual biomass removals (t/yr)*~~

~~*The Total Annual Biomass Removals (R) for Nigeria is inferred by calculating the sum of the Mean Annual Increment in biomass growth (MAI) and the Annual Change in Living Forest Biomass stocks (ΔF). Given biomass growth (MAI) and change in stock (ΔF) are both known, the balancing removals (R) is calculated as the sum of the two as follows:*~~

~~R = MAI + ΔF (3)~~

[59] Usman, B.A. and Adefalu, L.L. (2010) Nigerian forestry, wildlife and protected areas: Status report. Biodiversity 11(3), 44 – 52. PAGE 50

[60] ITTO. (2009) Encouraging Industrial Forest Plantations in the Tropics - Report of a Global Study. International Tropical Timber Association. Available from: http://www.itto.int/direct/topics/topics_pdf_download/topics_id=2165&no=0&disp=inline. PAGE 68

[61] ~~The approach is applicable to Nigeria as a party since it had fewer than 10 registered clean development mechanism project activities as of 31 December 2010.~~

Where,

MAI — *Mean Annual Increment in biomass growth (t/yr)*

ΔF — *Annual Change in Living Forest Biomass stocks (t/yr)*

The Mean Annual Increment of biomass growth (MAI) is calculated in equation 4 below as the product of the Extent of Forest (F) in hectares and the Nigeria Growth Rate (GR) of the Mean Annual Increment as follows:

MAI = F x GR ***(4)***

Where,

F — *Extent of Forest (ha)*
GR — *Annual Growth rate of biomass (t/ha-yr)*

The demonstrably renewable biomass (DRB) is calculated in equation 5 below as the product of Protected Area Extent of Forest (PA) in hectares and the country-specific Growth Rate (GR) of the Mean Annual Increment:

DRB = PA x GR ***(5)***

Where,

PA — Protected Area Extent of Forest (ha)
GR — Annual Growth rate of biomass (t/ha-yr)

The parameters used and the data sources are summarised in the table below:

Nigeria fNRB Estimation (based on EB67, Annex 22)

Parameter	Description	Equation	Value	Data Source	Considerations
$f_{NRB,\%}$	Fraction of non-renewable biomass	NRB/(NRB+DRB)	93%	Calculated as per equation 1 (EB 67, Annex 22)	
NRB, t/yr	Non-renewable woody biomass	R-DRB	114,417,824	Calculated as per equation 2 (EB 67, Annex 22)	Proportion of Total Annual Biomass Removals (R) that is not demonstrably renewable
DRB, t/yr	Demonstrably renewable biomass	PA*GR	8,610,888	Calculated as per equation 5 (EB 67, Annex 22)	Calculated as equivalent to the total annual biomass growth in protected areas
R, t/yr	Total Annual Biomass Removals	MAI+ΔF	123,028,712	Calculated as per equation 3 (EB 67, Annex 22)	Used as a national-level proxy for B_y. Accounts for all removals (not only woodfuels), which is

					equivalent to the sum of Mean Annual Increment of biomass growth and the Annual change in living forest biomass.
MAI, t/yr	Mean Annual Increment of biomass growth	F*GR	31,028,712	Calculated as per equation 4 (EB 67, Annex 22)	Country-specific MAI calculated from extent of forest and its growth rate.
ΔF, t/yr	Annual change in living forest biomass		-92,000,000	Annual change in living stock biomass 2005-2010 (FAO Forest Resource Assessment 2010 Global Tables, Table 11. Carbon stock/biomass conversion rate (2003 IPCC Good Practice Guidance for Land-Use Change and Forestry, Chapter 3): 0.5 is used as a default for carbon fraction of dry matter	The annual change in carbon stock in living biomass 2005-2010 (t-carbon/yr) from Table 11 (-46,000,000 t-carbon/yr for Nigeria) is converted to Annual Change in Living Forest Biomass 2005-2010 (t/yr) by dividing with 0.5, the default value for conversion. See http://foris.fao.org/static/data/fra2010/FRA2010GlobaltablesEnJune29.xls and http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Chp3_2_Forest_Land.pdf
F, ha	Extent of forest		9,041,000	FAO Forest Resource Assessment (FRA) 2010 Global Tables, Table 2	See http://foris.fao.org/static/data/fra2010/FRA2010GlobaltablesEnJune29.xls
GR, t/ha-yr	Annual growth rate of biomass		3.43	Distribution of total forest area by ecological zone (FAO Global Forest Resource Assessment 2000, Table 14; http://www.fao.org/docrep/004/Y1997E/y1997e21.htm Above ground biomass growth rates (t/ha-yr) for different ecological zones (2006 IPCC Guidelines for National Greenhouse Gas Inventories,	Annual growth rate of biomass has been calculated as the weighted average based on FAO reporting on distribution of total forest area by ecological zone and IPCC above ground-ground biomass growth rates for different ecological zones: Tropical rainforests at 22%, tropical most forest at 36%, tropical dry forest at 38%, tropical shrubland at 2%, and

				Chapter 4, Table 4.9) http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf	topical mountain forest at 2%.
PA, ha	Protected area extent of forest		2,509,000	FAO Forest Resource Assessment (FRA) 2010 Global Tables, Table 6	See http://foris.fao.org/static/data/fra2010/FRA2010GlobaltablesEnJune29.xls
	Annual change in carbon stocks in living forest biomass (2005-2010)l t/yr		-46,000,000	FAO Forest Resource Assessment (FRA) 2020 Global Tables, Table 11	See http://foris.fao.org/static/data/fra2010/FRA2010GlobaltablesEnJune29.xls
	Carbon stock/biomass conversion rate		0.5	Default value (2003 IPCC Good Practice Guidance for Land-Use Change and Forestry, Chapter 3 and EB 67, Annex 22)	

Appendix 4. Further background information on ex ante calculation of emission reductions

Calculation of B_{old}

Extrapolation of fuelwood consumption -Households from 2000-2017 Data			
Country	Commodity	Year	Quantity (1000 m3)[62]
Nigeria	Fuelwood - Consumption by households	2000	116524.7947
Nigeria	Fuelwood - Consumption by households	2001	119491.0783
Nigeria	Fuelwood - Consumption by households	2002	122544.6086
Nigeria	Fuelwood - Consumption by households	2003	125697.7559

[62] [62] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW%3btrID%3a1231#f_1

Nigeria	Fuelwood - Consumption by households	2004	128968.4729
Nigeria	Fuelwood - Consumption by households	2005	132370.0055
Nigeria	Fuelwood - Consumption by households	2006	135906.185
Nigeria	Fuelwood - Consumption by households	2007	139577.9967
Nigeria	Fuelwood - Consumption by households	2008	143391.133
Nigeria	Fuelwood - Consumption by households	2009	147348.4401
Nigeria	Fuelwood - Consumption by households	2010	151451.7789
Nigeria	Fuelwood - Consumption by households	2011	155704.8714
Nigeria	Fuelwood - Consumption by households	2012	160105.9661
Nigeria	Fuelwood - Consumption by households	2013	164461.6311
Nigeria	Fuelwood - Consumption by households	2014	168895.3476
Nigeria	Fuelwood - Consumption by households	2015	173392.8845
Nigeria	Fuelwood - Consumption by households	2016	177995.5118
Nigeria	Fuelwood - Consumption by households	2017	182681

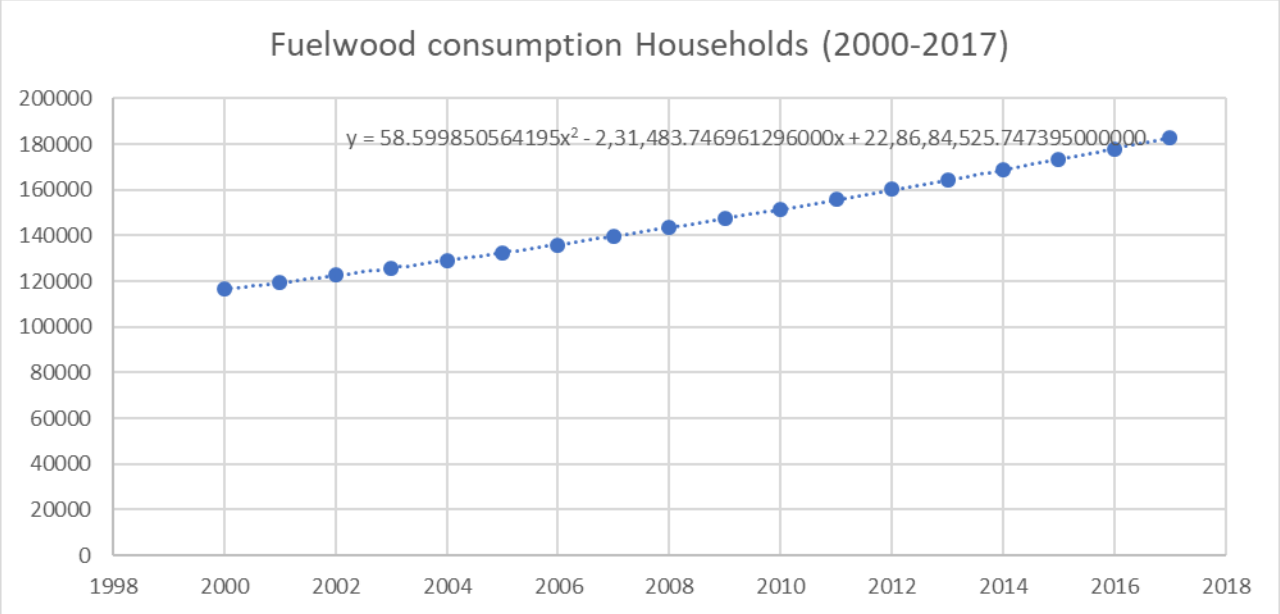
The household fuelwood consumption value for 2018 was extrapolated using a second-order polynomial (quadratic) regression in R. The reported fuel wood consumption values from 2000 to 2017 was used to determine the equation –

$$y = 58.599850564195 \times x^2 - 231483.746961296000 \times x + 228684525.747395$$

where y= fuelwood consumption for x year
and x in this case = 2018.

$$y_{2018} = 58.599850564195 \times 2018^2 - 231483.746961296000 \times 2018 + 228684525.747395$$

$$y_{2018} = 187{,}902{,}228\ m^3$$



2nd order polynomial regression equation

-	Parameter	Unit	Value	Source

A	Fuel wood consumption 2018	m^3	18,79,02,228	extrapolated from UN Data [1] Calculation in "Projection of 2018 Value" sheet
B	Density of wood	tons/ m^3	0.725	FAO [2]
C	Fuel wood consumption 2018	tons	13,62,29,116	Calculated (A*B)
D	Population of Nigeria (2018)	#	19,58,74,740	World Bank[3]
E	Share of population using wood for cooking	%	66.50%	Nigeria General Household Survey-Panel Wave 4; 2018/19
F	Population using wood for cooking	#	13,02,56,702	Calculated (D*E)
G	Average fuelwood consumption per capita	tons / y	1.040	Calculated (C/F)
H	Average household size	#	5.500	Nigeria General Household Survey-Panel Wave 4; 2018/19
-	Fuelwood consumption per household (B_{old})	tons / y	**5.720**	Calculated (G*H)

Reference

1 http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW%3btrID%3a1231#f_1
2 http://www.fao.org/docrep/008/j0926e/J0926e07.htm
3 https://data.worldbank.org/indicator/SP.POP.TOTL?locations=NG

The detailed calculation can be referred from the “Nigeria Baseline Fuelwood consumption assessment (2018)” excel sheet.

~~BASELINE INFORMATION~~

~~Kaduna State~~

~~Location of baseline~~

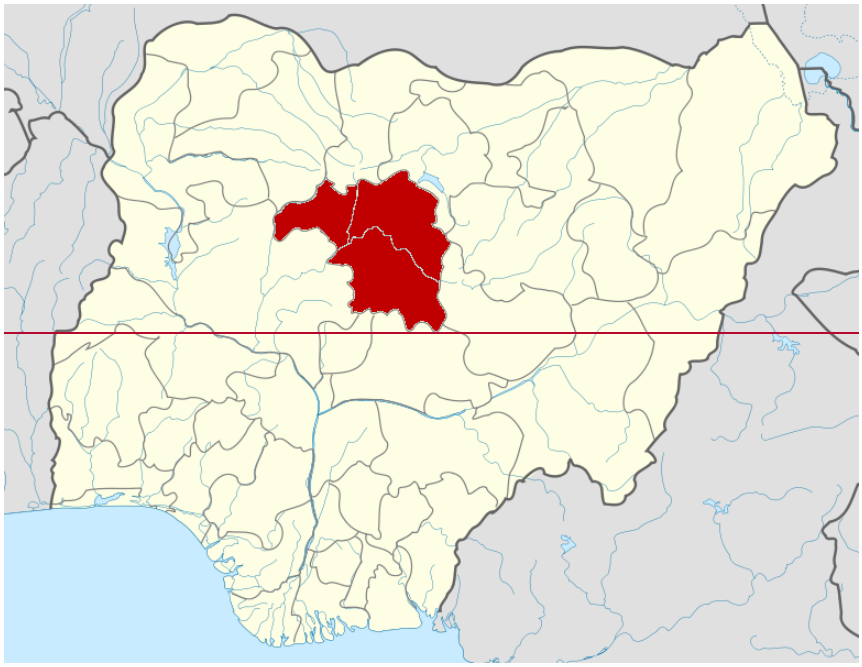
~~The baseline scenario is identified for Kaduna State, Nigeria, indicated in the map below.~~

NIGER

BENIN

NIGERIA

CAMEROON



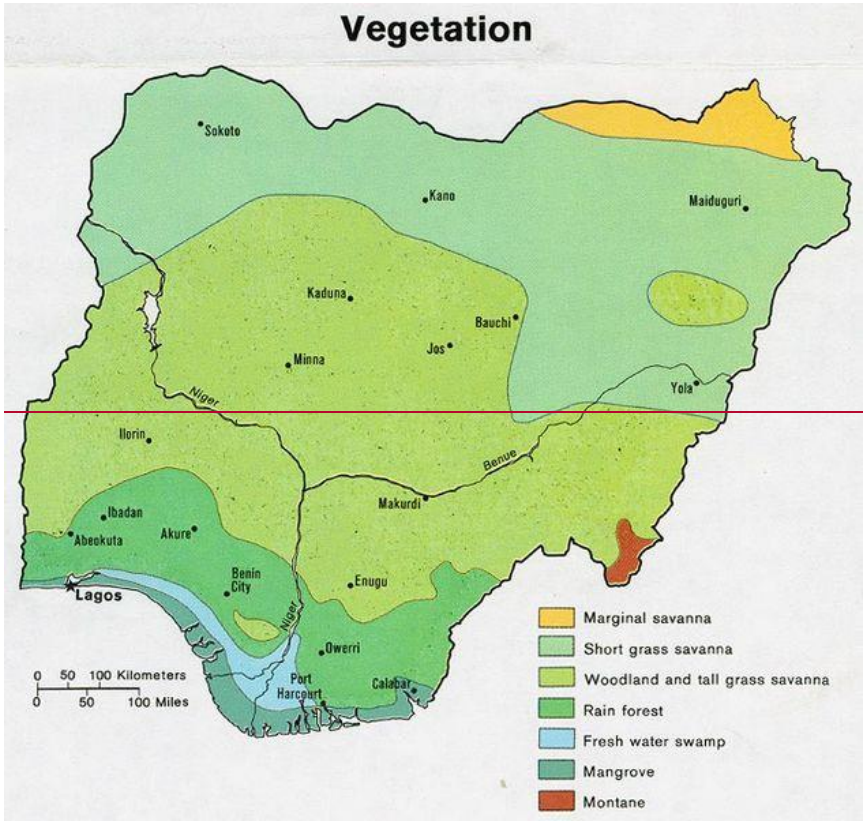
Map of Nigeria (Kaduna State highlighted in red)
Source: http://en.wikipedia.org/wiki/Kaduna_State (for which permission is granted to copy, distribute and/or modify this document under the terms of the Creative Commons Attribution-Share Alike 3.0 Unported license)

Kaduna State was chosen as the geographic boundary, thus the location for the baseline investigations because of the significant markets for ICS are expected to be found in both urban and rural areas of Kaduna State.

According to the Nigeria National Bureau of Statistics data[63], over 90% of both rural and urban households in Kaduna State rely on wood for cooking. The average household members per urban and rural households are similarly high compared to other states, 9.0 and 10.7 respectively[64]. Kaduna State is located in the Guinea Savannah region, which is an ecologically homogenous region within Nigeria that is characterized by woodlands and tall grasses. The climate is also homogenous across Kaduna and classified as a tropical savanna climate.

[63] National Bureau of Statistics, Social Statistics in Nigeria 2009, Federal Republic of Nigeria.

[64] *Ibid*



~~Vegetation types of Nigeria~~
~~Source: http://en.wikipedia.org/wiki/Geography_of_Nigeria (this image is a work of the US Government and is in the public domain.)~~

~~Sampling Design~~

~~*Objective.* A baseline fuel consumption survey was conducted in Kaduna State in July 2010. The objective was to determine the mean weekly fuelwood consumption for households in Kaduna State. To satisfy the conditions for AMS IIG and EB69 Annex 4 standards for sampling, a confidence interval of 90% with a margin of error of ≤ 10% must be met.~~

~~*Target Population.* A literature review and consultations revealed that the project area is fairly homogenous and the sampling strategy was designed in such a way as to be representative of the proposed area of dissemination of stoves, which is both urban and rural areas of the state of Kaduna.~~

~~*Sampling Method.* A HED Consulting (HED) team led the planning of this study. Aspects of the study design, such as identification of study locations and questionnaire development, were carried out in collaboration with the team from SOSAI, Nigeria, who also trained and supervised the survey team in Nigeria. Analysis was undertaken using Excel by HED.~~

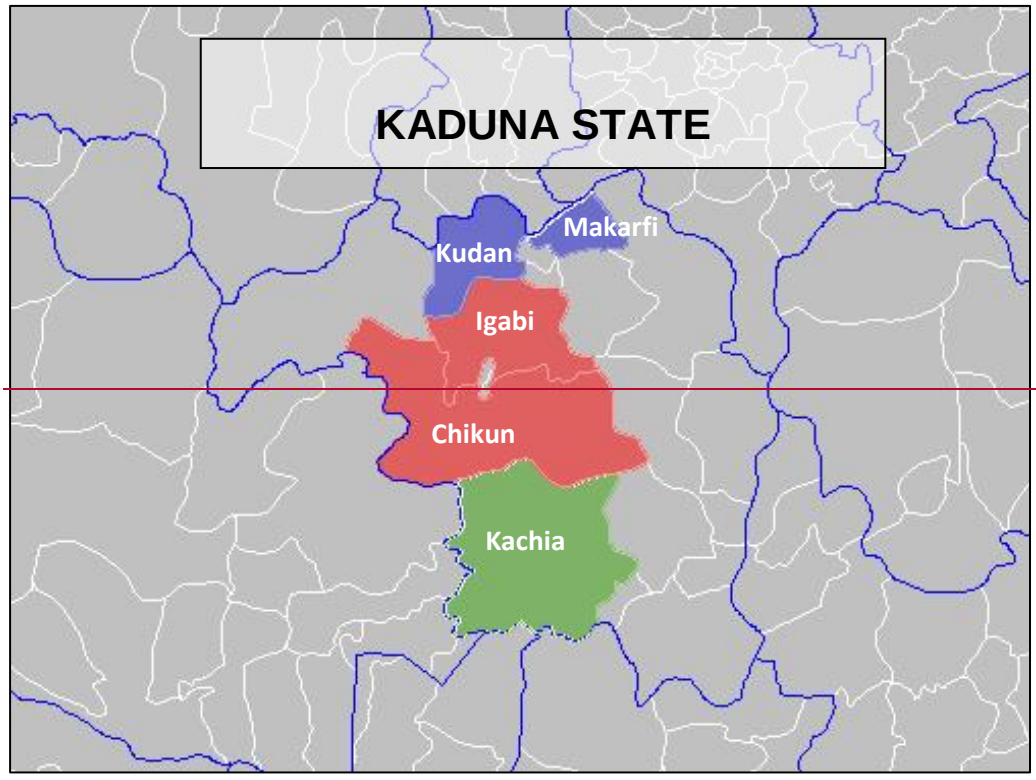
~~At the time of the survey, an acute religious crisis between Christians and Muslims was prevailing in northern Nigeria, which includes Kaduna State, and distrust of outsiders was and remains an acute problem. Therefore, areas deemed unsafe by the survey team were excluded from the areas to be sampled, thus limiting the sample frame. Logistical conditions of the survey team also put limitations on areas to be visited: surveyors were required to return before the government curfew in the absence of secure lodging options outside the city of Kaduna.~~

~~CQC and HED relied on local knowledge by the survey team from SOSAI, Nigeria as well as consultations with Dr. Salisu Mohammed (PhD), Department of Geography, Bayero University, Kano to determine areas to be sampled that are representative of fuelwood users from both urban and rural areas in Kaduna.~~

The final sample included a total of 13 rural and urban villages from 5 local government areas (LGAs) covering the north, central and southern regions of the State. These are presented below.

Sampled Villages

-	REGION OF KADUNA	LGA	Village	# HHs SURVEYED
RURAL	Central	Igabi	Kutungare	20
	Central	Chikun	Kujama	20
	North	Kudan	Bagadi	9
	North	Kudan	Bagadi Tashan Dauda	9
	North	Makarfi	Ruma	25
	Central	Chikun	Dutse	26
			Subtotal	***109***
URBAN	North	Kudan	Likoro	20
	Central	Igabi	Jaji	21
	North	Makarfi	Makarfi	26
	South	Kachia	Katari	26
	Central	Chikun	Buruku	30
	Central	Chikun	Kidunu - Rido	9
	Central	Chikun	Rido	10
			Subtotal	***142***
			TOTAL	**251**



Local Government Areas where baseline survey was conducted
Modified from the following source: http://en.wikipedia.org/wiki/File:Nigeria_Local_Government_Areas.png (This work has been released into the public domain by its author, I, Rarelibra.)

Household-level random sampling strategy. Fieldworkers were instructed to identify a central point in selected areas and to spin a bottle (or some similar way of randomly selecting a direction in which to travel) and to begin identifying homes for surveys in that direction. When one survey was completed, the surveyor would move to the next-but-one household until a new suitable household was identified.

Sample size determination. The number of households were selected to satisfy the conditions for AMS IIG, which also meets EB69 Annex 4 standards for sampling, i.e. the baseline study must meet or exceed the confidence interval of 90% with a margin of error of ≤ 10% of sample mean.

A previous woodfuel household consumption study undertaken earlier in 2010 in neighbouring Kano gave a COV (coefficient of variation) of 0.55. To achieve 90/10 precision, the following sample size would be required at this level of variation: (1.645 * 0.55/0.1)^2 = 82

Therefore, based on the assumption that data variability would be similar in Kaduna, to allow for some loss the survey team was requested to survey at least 100 households across Kaduna.

When the data from 100 households in Kaduna was reviewed, the variability was somewhat higher (COV = 0.81). This indicated a sample size of 178 was required to achieve 90/10 precision: (1.645 * 0.81/0.1)^2 = 178

In order to ensure the precision requirement were satisfied in the second round of data collection, fieldworkers were requested to return to the field to conduct a further 140 HHs to allow for any further loss, ultimately surveying a total 251 households.

Establishing the precision of the final dataset. The data generated from the 251 households surveyed for this baseline survey can be shown to have met the precision requirements of AMS IIG and EB69 Annex 4 standards for sampling (90/10), using the following equation:

$$n = [\frac{Zscore * COV}{\Pr}]^2$$

Where:

Z score for 0.9 confidence interval = 1.645
COV = Coefficient of Variation = standard deviation / mean = s / μ
Pr = Precision = 0.1 (i.e. 10%, as per AMS IIG Version 03)

Re-arranged and substituted, we see that:

$$\mu = \bar{x} \pm \left[1.645 * \left[\frac{s}{\sqrt{n}}\right]\right]$$

Where

μ = actual mean
$\bar{x}$ = sample mean (101.7 kg/week/hh)
s = standard deviation
n = sample size (251 households)

The AMS-IIG Version 03 methodology requires a precision of 90% confidence (z-score 1.645) with a 10% margin of error.

If $\left[1.645 * \left[\frac{s}{\sqrt{n}}\right]\right] \leq 0.1 * \bar{x}$

Inserting values we see that

$$\left[1.645 * \left[\frac{70.9}{\sqrt{251}}\right]\right] \leq 0.1 * 101.7$$

Resolved: 7.36 < 10.17

This demonstrates that for 90% confidence, the margin of error is less than 10%. Therefore, this baseline fuel consumption figure exceeds the precision requirements of AMS-IIG Version 03 and EB 69 Annex 4.

Accuracy of the survey. The survey used to determine baseline fuel consumption employed a series of techniques to ensure accuracy, including asking respondents to visually show how much wood was used daily and weighing this using digital scales; as well as asking how much money respondents spent on fuelwood each week and translating this into quantities based on prices determined from local wood vendors.

Follow-up Survey. A follow up survey of 100 households in urban and rural areas in Kaduna was conducted during June 2011 to establish number of stoves used simultaneously for cooking, and seasonal variation. This study contributes a refinement to the baseline developed during the previous study. In order to provide more accurate estimates of emission reductions this study aimed to capture the average number of stoves used *simultaneously* for cooking per family unit. The survey was carried out on a sample of 60 urban and 40 rural households in Kaduna State, Nigeria. These 100 households were randomly selected from the study population of the July 2010 Kaduna survey. If the original households could not be located a replacement household was identified within the same community using the same inclusion criteria for the July 2010 survey; i.e. locating a central point in the selected area and spinning a bottle (or using some way of randomly selecting a direction in which to travel) and begin identifying homes for surveys accordingly, as in the original study. HED defined the sample size and provided guidance to the field team on sample selection. Analysis was undertaken using Excel and SPSS 16.0 by HED.

Key findings

The baseline fuel consumption from the July 2010 survey was found to be uniform across rural and urban locations. After basic data cleaning (removal of top and bottom 5% of outliers) the baseline fuel consumption was calculated as 101.7 kg/ week/ stove. This is equivalent to 5.29 tonnes woodfuel / year/ stove.

The follow-up survey indicated that:

- 85% of cooks usually cook for guests in addition to their family, which is likely to explain why the average number of eaters per household identified in the baseline exceeded the average household size data for Nigeria.
- 55% of cooks live in households where more than 1 family unit cooks separately. This is likely to explain why multiple stoves are sometimes seen – often burning at the same time – in individual households; they are being used by individual family units living in the same household.
- 60.8% of respondents used more than one stove simultaneously more than once per week, however the majority used them for only a fraction of cooking; for example when they were rushed or had extra guests. The mean number of fires/ stoves used simultaneously is 1.23 (n=97; SD 0.27; 95% CI 1.18-1.29). This equates to an adjustment being applied to the baseline of 1/1.23 = 0.813.
- 15% of households switched to other fuels during rain, which accounts for approximately 33% of the 'rainy season' (i.e. one meal per day), itself 5 months long. To account for this an adjustment of 0.979 is made to the baseline collected during the dry season. This is conservative in light of baseline consultations which identified negligible seasonal variation among respondents.

Adjustments: The baseline survey concluded that 5.29 tonnes of woodfuel are consumed by each cook cooking for her family unit. The follow up survey enable this figure to be refined to account for minor seasonal variation, and occasional multiple stove use, as follows:

Adjusted conservative baseline woodfuel consumption = 5.29 * 0.813 * 0.979 = 4.21 tonnes / year. This is equivalent to 81.0 Kg wood consumed per family cooking unit per week.

Note: This is an ex-ante estimate of discounting the wood usage baseline. Households that use a second stove simultaneously with an ICS at least once per week will be a monitored parameter and adjustments will be made to woodfuel consumption (B_{old}) during each monitoring period.

The baseline fuel consumption data closely agrees with findings from other studies undertaken in Nigeria, such as one undertaken in neighbouring state Kano[65] in 1987 which concluded fuel consumption of 83Kg/ week/ stove or 4.316 tonnes/appliance/HH/year. In addition, the registered PoA developed by Atmosfair titled "Improved Cooking Stoves for Nigeria Programme of Activities" determined the national mean baseline woodfuel consumption using historical data, resulting in 5.536 tonnes/appliance/HH/year[66]. Atmosfair's registered small-scale CDM project activity titled "Efficient Fuel Wood Stoves for Nigeria" conducted a baseline household survey representative of the Guinea Savanna Region, for which Kaduna State is located, resulting in a mean fuelwood consumption of 4.6534 tonnes/HH/year[67].

Thus 4.21 tonnes/appliance/HH/year is a conservative Bold value compared to historical surveys and other registered CDM projects in Nigeria applying the same methodology (AMS.IIG).

[65] ClineCole, R, JA Falola,, HAC Main, MJ Mortimore, JE Nichol, and FD O'Reilly. 1987. Woodfuel in Kano. Bayero University, Kano.

[66] PoA-DD: http://cdm.unfccc.int/filestorage/4/5/L/45LJ08PE3T9MH27ZVFQNA6IYDOGWSX/5067%20CDM-POA-DD.pdf?t=SHZ8bWJ5MWdnfDAMS6Q5NxWCWhyCOSYnhful PAGE 35

[67] PDD: http://cdm.unfccc.int/filestorage/E/P/I/EPIU9032FNX7DHRK4VBTGW5LQMZ1C8/Nigeria%20PDD.pdf?t=MFJ8bWJ5MmNlfDBtiQKo3T6ClUcXMYIaYGts PAGE 30

BASELINE INFORMATION

Firewood Consumption Study

Kaduna and Kano States, Nigeria

Baseline Study For C Quest Capital LLC

ABHAssociates – Survey Design and Analysis

Habiba Ahmed-Ali, SOSAI Nigeria – Field Operations

- CONFIDENTIAL -

25 November 2012

Contents

Acronyms

CDM	Clean Development Mechanism
CI	Confidence interval
CQC	C Quest Capital LLC
HH	Household
PoA	Programme of Activities

Document development record

Date	Content	
6 November 2012	Draft report completed	ABHAssociates
25 November 2012	CQC comments integrated into report. Final report delivered	ABHAssociates

For consistency purposes, this baseline report follows the same reporting structure, survey design, data collection tools and report text created by HED Consulting for other baseline reports conducted under the "Distribution of Improved Cook Stoves in Sub-Saharan Africa" Programme of Activities.

Executive summary

A field survey was undertaken in October and November 2012 in Nigeria, in the states of Kano and Kaduna, with the following objective:

To determine the amount of firewood consumed on average per household for domestic cooking while taking into account seasonal variations in firewood consumption and multiple stove use.

The survey and this report were commissioned by C-Quest Capital LLC, in support of CDM programmes for improved cook-stove dissemination.

The survey design, implementation and analysis were undertaken in compliance with the CDM Standard for Sampling and Surveys[68] and the Methodology AMS II.G version 3. A reliability level of 90/10 confidence/precision was therefore a requirement.

The sampling strategy undertaken followed the most recent guidelines published by the CDM, and a choice was made to apply Multi-Stage Sampling as defined by Example 8, Appendix A, Best Practice Examples for sample size calculations, Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities, EB69 Annex 5.

In compliance with Example 8, a random selection was made of a number of wards[69] within the two states of Kano and Kaduna; once a short-list of wards was established in this way, then a certain number of households inside these wards were also selected randomly. This sampling approach and results are considered representative of the baseline wood consumption in the wards of the proposed stove dissemination area.

[68] Standard for Sampling and Surveys a for CDM Project Activities and Programme of Activities, EB 69 Annex 4

[69] A ward is a small subdivision of a Local Government (LG) Area.

One outcome of the interviews and fuel measurements was that the number of valid interview results was not the same in each ward visited. In order for Equation 33 presented in Example 8 to function as a test of precision, it was necessary to remove some results from each ward until an equal number of results existed across all wards visited. A random approach was adopted to accomplish this, in order to ensure that all results remained random selections; since the order in which results appeared in the database was random, the surplus samples were therefore removed by taking the first valid samples in the database up to the required number, and omitting the residual samples.

Further, the following adjustments were made:

Adjustment to account for seasonal variation in firewood consumption
Adjustment to account for the simultaneous use of multiple stoves
Identification and removal of outliers

In conclusion, the mean baseline firewood consumption calculated to 14.01 kg firewood per stove per day or **5.11 tonnes firewood** per stove per year, at 90 % Confidence and 10% precision as required by Clause 22 of the methodology AMS-II.G Energy efficiency measures in thermal applications of non-renewable biomass Version 3.0, and by the sampling guidelines of EB69 Annex 5.

The baseline fuel consumption data closely agrees with findings from other studies undertaken in Nigeria, such as the one undertaken by Atmosfair for their PoA titled "Improved Cooking Stoves for Nigeria Programme of Activities." They determined the national mean baseline woodfuel consumption using historical data, resulting in 5.536 tonnes firewood per stove per year[70].

Methods

Team Members

ABHAssociates planned the study. SOSAI trained and supervised the survey team and led the survey. Analysis was undertaken using Microsoft Excel by ABHAssociates.

Sampling strategy

Kaduna and Kano states are divided into 67 local government (LG) areas. Within these areas the population is divided into 739 wards.

The study sample was selected using multi-stage sampling following the guidelines of EB 69 Annex 5 and the standard contained in EB 69 Annex 4.

It was decided to use multi-stage sampling as it was not practical to use a simple random sampling technique across the whole sample area. Wards were selected as the appropriate "group" of households. Random visits to wards in Kano and Kaduna demonstrated homogeneity of cooking patterns and firewood consumption patterns (see section 6.1 for further details on homogeneity). Within wards, a simple random sampling technique was applied to selection of households to be sampled.

The sampling frame consisted of all wards located in the two states; there were no exclusions within this geographic area, which therefore included urban, peri-urban and rural households. Wards were randomly selected using a random number generator, and households within the ward were then selected using simple random sampling.

[70] PoA-DD: http://cdm.unfccc.int/filestorage/4/5/L/45LJ08PE3T9MH27ZVFQNA6IYDOGWSX/5067%20CDM-POA-DD.pdf?t=SHZ8bWJ5MWdnfDAMS6Q5NxWCWhyCOSYnhfuI PAGE 35

Figure 1: LGs in Kaduna states

Figure 2: LGs in Kano state

Methodological implications of household recruitment

To qualify for participation in this survey, households were asked 'Is most of your cooking done on a traditional firewood stove?' This identified households whose main fuel was firewood but did not

exclude users of other stoves and fuels. 'Most cooking' is assumed to have been interpreted by households as 'more than half of cooking'.

Households were chosen at random within the wards and, once it was established that the household met the inclusion criteria and were willing to participate, the survey was carried out.

Pre-Survey Sample size determination for B_{old}

The sample size required to determine B_{old} was estimated following equation 33 in EB 69 Annex 5. Estimates were made of the number of wards that would comprise the sample, together with a corresponding number of households to be sampled randomly within each ward. The likely variances were estimated on the basis of previous studies. It was possible to estimate sample size to conform to 90% confidence and 10% precision in conformity with the methodology AMS-II.G and EB 69 Annex 5. The sample size options calculated are presented in Table 1.

Table 1: Sample sizes for B_{old}

Option	1	2	3	4	5
u (HH to sample)	5	10	15	20	25
Wards	31	19	15	14	12
Total HH	155	190	225	280	300

It was decided to conduct the survey in practice with 20 households in each of 20 wards, to be safe in terms of possible non-compliance and incidence of outliers.

The analysis of field results showed that in practice better than 10% precision was achieved at 90% confidence using a sampling rate corresponding to option 2. This sampling rate was required in the case of actual field results, because in some wards less than 15 valid results were obtained, while in all wards more than 10 or more valid results were obtained.

Questionnaire

A questionnaire deployed explored the many factors that can impact domestic firewood use, including seasonal variation; uses of the stove other than for cooking; and use of more than one stove at the same time (see Annex 0 for Questionnaire).

Measurement of firewood

A screening questionnaire was designed to identify households that had sufficient fuel available to be able to show one full day's use. Households were asked 'How much firewood do you use in an average day? Please make a pile for me to weigh'. The field survey team then took careful measurements and recorded the weights of the piles of firewood presented.

Quality control

Local field staff received training on how to administer the questionnaire to ensure that concise, complete and accurate data was collected. To complete training, the questionnaire was piloted in the field, along with the data transcribing and reporting spread-sheet and process. During this piloting stage, any aspects of the questionnaire that caused confusion amongst the trainees or any failures to collect the correct data were reviewed and the field staff were given feedback. The surveyors were given a field guide describing how to implement the survey and how to collect robust, accurate data. The team were then supervised daily during the survey by a trained field Supervisor.

Double-entry of data was completed on a randomly selected 10% sample of transcripts. This was compared with the original dataset to identify the frequency and nature of data-entry error. Examination of the double-entry data showed that there was 0% error in the key variable, firewood-weighing data. Therefore the data-entry process was deemed accurate

Quality control was also exercised by careful monitoring of the survey process, as follows:

An examination was made of the potential for bias through refusals to participate by a certain type

of household; in practice this was not found to occur, there being only 5 refusals in all, only 1.2% of all interviews, indicating no significance.

A small number of minor discrepancies were identified between responses to question A1 ('Do you mostly use woodfuel on a traditional fire or stove for cooking in your home?') and section K (which investigates the amount of cooking done with other fuels at this time of year).

Of all households that reported wood as being their primary fuel in A1, in section K a small number of households reported using crop residues or charcoal for more than half of all cooking. However, because section K is asking specifically about this time of year, while question A1 is intended to reflect the year in general, more weight is due to the response in A1, and so these households were retained in the study population. Moreover, including households that report higher levels of usage of other fuels would tend to make the baseline estimation more conservative.

Analysis

Unadjusted data

ABHAssociates used a random number generator to determine the wards to be sampled. The results can be seen in Table 2. Each ward in the full list of 739 wards in Kaduna and Kano was assigned a number, and 20 numbers in the range 1 to 739 were randomly generated.

Table 2: Wards selected for sampling

Random Numbers Generated	Corresponding Ward	State	LG
498	Kahu	Kano	Kibiya
121	Iddah	Kaduna	Kagarko
128	Buda	Kaduna	Kajuru
276	Bagwai	Kano	Bagwai
399	Zugachi	Kano	Gabasawa
585	Gama	Kano	Nasarawa
548	RigarDuka	Kano	Kura
731	Dagamawa	Kano	Wudil
72	Godogodo	Kaduna	Jema'a'
734	Indabo	Kano	Wudil
204	Muchia	Kaduna	Sabon Gari
703	Zarogi	Kano	Tsanyawa
11	Randagai	Kaduna	Birnin Gwari
143	Bondon	Kaduna	Kaura
60	Sabchem	Kaduna	Jaba
424	Gamoji	Kano	Gaya
118	Kushe	Kaduna	Kagarko
692	Tshon Gari	Kano	Tudun Wada
502	Tarai	Kano	Kibiya
474	Jakara	Kano	Kano Municipal

The field survey data collected by SOSAI is summarised in Table 3:

Table 3: Raw data for B_{old}

Ward	Number of completed questionnaires	Mean B_{old} – Unadjusted wood consumption kg/day/household
Buda	26	14.36
Muchia	21	13.15
Bondon	17	11.66
Godogodo	21	15.23
Randagi	20	18.45
Sabchem	14	10.26
Kushe	21	12.87
Iddah	20	14.64
Dagumawa	23	10.15
Gama	14	13.98
Indabo	22	15.40
Gamoji	21	14.09
Zugachi	21	11.64
Tsohon Gari	20	11.54
Tarau	14	12.03
Kahu	19	15.10
Jakara	21	9.95
Zarogi	22	12.73
Bagwai	20	15.04

The multi-sampling approach required that each ward has an equal number of samples. To comply with this approach the first recorded samples were removed in each case therefore not introducing any bias in choice of samples eliminated.

As the number of samples in each ward was less than 30, the outliers were identified using the concept of 'fences' as defined by the upper and lower quartiles of the sampled data in accordance with the following formula[71] :

Inner lower fence: $Q_1 - 1.5\ (Q_3-Q_1)$

Inner upper fence: $Q_3 + 1.5\ (Q_3-Q_1)$

Where Q_3 and Q_1 are the upper and lower quartiles of the sampled data respectively. Outliers in this case are defined as those data points in the sample below the inner lower fence or above the inner upper fence. A total of 29 outliers were identified and removed, including one ward. The conclusion was that 19 wards remained valid and within these wards, the equal number of samples reduced to 10, since one ward (Gama) was reduced to 10 valid samples.

Adjustments were then made to each sample to adjust for seasonality and multiple stove use as

[71] Doane and Seward, 2011, *Applied Statistics in Business & Economics 3rd Edition*, 2011, p124 and 144

described in sections 3.2 and 3.3.

Accounting for seasonal changes in amount of firewood used

Participants were asked what they considered the current season to be and how long it lasted- as well as how long the 'other' seasons lasted. The information was used to calculate an adjusted daily firewood consumption taking into account seasonal changes throughout the year.

The seasonal fuel use adjustment increased the mean firewood usage value from 13.19 kg/HH/day (unadjusted value) to **17.23kg/HH/day**(see Annex 0 for details of this calculation).

Six households or 3.2% (n=190) of respondents reported that their main fuel varied according to season. 33.3% of these HH used kerosene as their main fuel in the rainy season, 33.3% in the dry hot season use crop residues as their main fuel (see section 0 for further discussion).

Simultaneous multiple stove use

Because some homes use more than one stove at once during some days of the week, the methodology AMS-II.G requires that the likely occasional continued use of traditional stoves alongside improved stoves is taken into account.

The questionnaire included a series of questions about the simultaneous use of more than one stove for cooking. These questions establish the proportion of cooking (and therefore firewood consumption) to be attributed to a single improved stove introduced by a dissemination programme.

The calculation of the average number of stoves used simultaneously for cooking per family unit took into account the frequency of simultaneous stove use as well as the number of times cooking took place per day. This was compared with the stated number of times households cooked (Question C1) adjusted for any seasonal changes in multiple stove use patterns to give a fraction adjustment (See Annex 0 for more detail).

Any household using its stove less than once per week was excluded from this adjustment as the impact of this may be considered negligible.

Overall the average (mean) number of stoves used simultaneously for cooking per household unit was approximately 1.25, and 51% of the respondents indicated they used more than one stove more than once per week.

An adjustment factor was applied to each household's mean firewood usage value (already adjusted for seasonal changes) individually according to its pattern of multiple stove use. The resulting value decreased to 14.01Kg/stove/day from the value of 17.23 Kg/HH/day. The value of 14.01 Kg/stove/day obtained after the adjustment to multiple stove use is the final fuelwood consumption baseline value for the states of Kano and Kaduna.

All further steps in analysis use these adjusted daily firewood weight values. The final results achieved can be seen in Table 4.

Result and precision achieved

The multiple-stove adjustment resulted in a decrease in the mean firewood fuel value adjusted for seasonal trends. The two adjustments taken together (see Table 4), resulted in an overall increase in the mean value of 0.82 kg/stove/day.

Table 4: Mean firewood consumption adjusted for seasonal changes and patterns of multiple stove use (kg/stove/day)

Ward	Number of completed questionnaires	Mean B_{old} – adjusted wood consumption kg/day/household
Buda	10	12.47
Muchia	10	10.83

Bondon	10	12.93
Godogodo	10	17.85
Randagi	10	14.14
Sabchem	10	15.02
Kushe	10	14.02
Iddah	10	12.42
Dagumawa	10	10.05
Gama	10	20.49
Indabo	10	10.77
Gamoji	10	11.79
Zugachi	10	11.80
Tsohon Gari	10	14.64
Tarau	10	18.95
Kahu	10	20.73
Jakara	10	11.92
Zarogi	10	10.85
Bagwai	10	14.83
Mean		14.01

The mean baseline firewood consumption calculated to 14.01 kg firewood per stove per day or **5.11 tonnes firewood per stove per year**. The survey achieved the precision required by the methodology of better than / equal to 10% at a 90% confidence level, the actual result being 9.88%, just slightly better than 10%. The confidence interval is 12.62 – 15.39 kg/stove/day.

Other factors investigated

The questionnaire survey included a number of questions on aspects of household energy behaviour, some of which may impact firewood consumption, as follows:

Supplementing firewood with crop residues

31.6% of homes supplemented their firewood with crop residues during the season when the survey was carried out. Table 5 shows the mean kg/stove/day according to the proportion of wood replaced with crop residues.

Table 5: Mean firewood consumption adjusted for seasonal changes and patterns of multiple stove use by crop residue use groups (kg/stove/day)

Current use of crop residues as cooking fuel	Mean firewood [SD]
None n=130	14.35 [6.42]
<1 meal per week n=40	12.66 [6.25]
A few meals per week n=11	14.24 [7.30]
About half meals per week n=8	16.42 [4.05]

More than half of all cooking n=1	4.72 [0]

It can be seen that the lower consumptions of crop residues fall into the confidence interval. The households that cook half their meals per week exceed the confidence interval, however the range of the SD falls within the confidence interval. The household that cooks with crop residues more than half the time falls below the confidence interval, but continuing to include this value is conservative.

Although one respondent, as discussed above, reported *currently* using crop residues for more than half of all cooking, it is recommended that this household be retained in the baseline dataset as they stated in response to Question A1 that they primarily used firewood for cooking in their home. Thus it is assumed that the relatively high usage of crop residues in these homes is during the season in which the survey was carried out only.

Space heating

1.1% (n=2) of respondents reported using their wood cooking stove for space heating when not cooking during the cold season and none in the season when the survey was carried out. Therefore the use of firewood stoves for space heating may be disregarded as a factor affecting the integrity of the baseline measurement.

Impact of using all of a household's firewood for weighing

Analysis was carried out to explore if there is a difference between the mean amount of fuel in those HH which had *all available* firewood weighed and those which had some left in their original wood pile in addition to that weighed. For example, some households presented all the wood they had to hand in their home for weighing; others presented a fraction. This section investigates any impact of this on the dataset.

Analysis on national data, adjusted for seasonal trends and multiple stove use, showed that the mean firewood use for those homes where all available firewood was weighed was 14.95 kg/day/stove [n=110 SD=6.55] whereas in those homes where there was some firewood remaining in the original firewood pile the mean was 12.78 kg/day/stove [n=66 SD=6.47].

Both of these values are well within the confidence interval of the overall mean. It is not deemed appropriate to exclude data from households on this basis.

Comparison of results with other studies

There are two other registered improved cook stoves projects in Nigeria, both developed by Atmosfair GmbH. One is a standalone project[72] that has a baseline fuel wood consumption of 96.20 kg/HH/week or 13.74 kg/HH/day and corresponds to the vegetation area found in Kaduna. This value is slightly lower than the overall mean found in this survey but well within the confidence interval. The second is a PoA[73] that uses a national baseline of 0.692tonnes/year/person. In this survey an average of 11.5 people per household was found equating to a baseline of 21.80 kg/household/year, considerably greater than the quantity found here. This information suggests that this survey is accurate and conservative.

[72] https://cdm.unfccc.int/Projects/DB/RWTUV1245685309.5/view

[73] https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/7R1B09HSJV3FKIZYCA4D6XQOETP5GN/view

References

Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, Version 3.0, EB 69 Annex 4

Guidelines for Sampling and survey for CDM Project Activities and Programme of Activities, Version 2.0, EB 69 Annex 5

Energy efficiency measures in thermal application for non-renewable biomass, AMS-II.G Version 3, EB 60 annex 21

Doane D. and Seward L., Applied Statistics in Business & Economics 3rd Edition,2011, p124 and 144

Annexes

6.1 Test for homogeneity

A homogeneous pattern of firewood consumption and cooking was observed by the field survey team during visits to the randomly selected wards. A test is applied to determine the existence or lack of statistically significant differences in firewood consumption among the states of Kano and Kaduna. The differences are tested according to the procedure below: $z = \frac{\overline{X}_1 - \overline{X}_2}{\frac{\sigma}{\sqrt{N}}}$

Where:

$\overline{X}_1$ is the firewood consumption in a first state. In this case Kano will be the first state and it has a mean firewood consumption of 5.20 tonnes/stove/year.

$\overline{X}_2$ is the firewood consumption in a second state (Kaduna). Firewood consumption in Kaduna is 5.00 tonnes/stove/year.

□ is the weighted standard deviation of the sample (2.04 Kg/stove/day)

N is the number os samples in both states

Applying these values to the formula above we get:

$$z = \frac{5.20 - 5.00}{\frac{2.04}{\sqrt{190}}} = 1.35$$

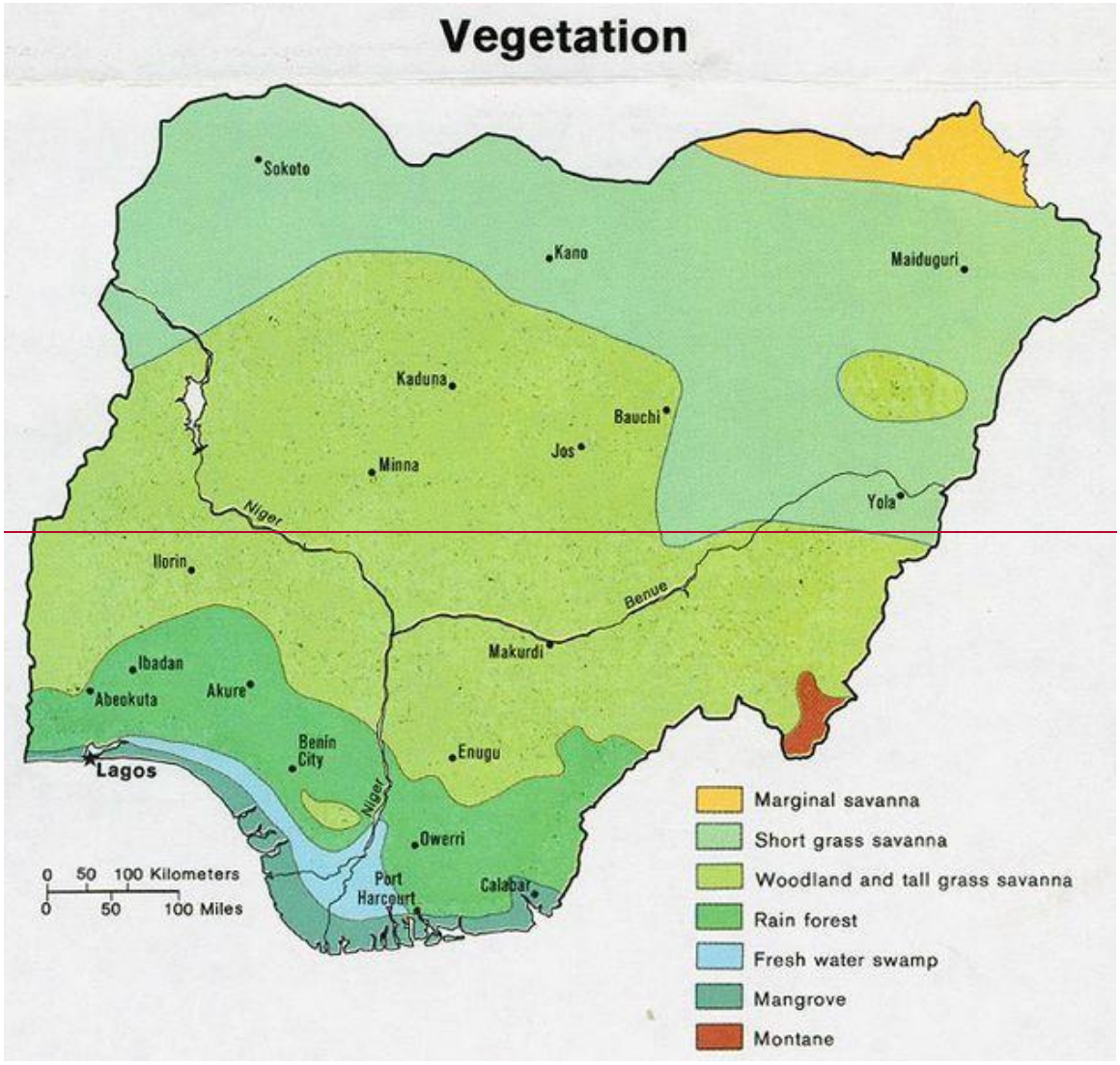
Note that the standard deviation value is the average standard deviation of the samples weighted to the number of samples in each state.

The resulting z-value is lower than the z-value outlined in EB 69 Annex 5 for a 90% confidence interval, and therefore there is no evidence that the populations in the States of Kano and Kaduna are different. Furthermore, the baseline fuel consumption values from Kano and Kaduna differ only by 4% (5.20/5.00-1); still below any precision requirements of AMS-II.G version 03 and the EB 69 Annex 4. Therefore, the combined baselines from Kano and Kaduna can be considered homogeneous.

Nevertheless a further test is applied here, to see if the

In addition, a further test is applied to assess if the two vegetative zones that make up Kaduna and Kano states of Nigeria show any significant difference in firewood consumption. This analysis is presented below.

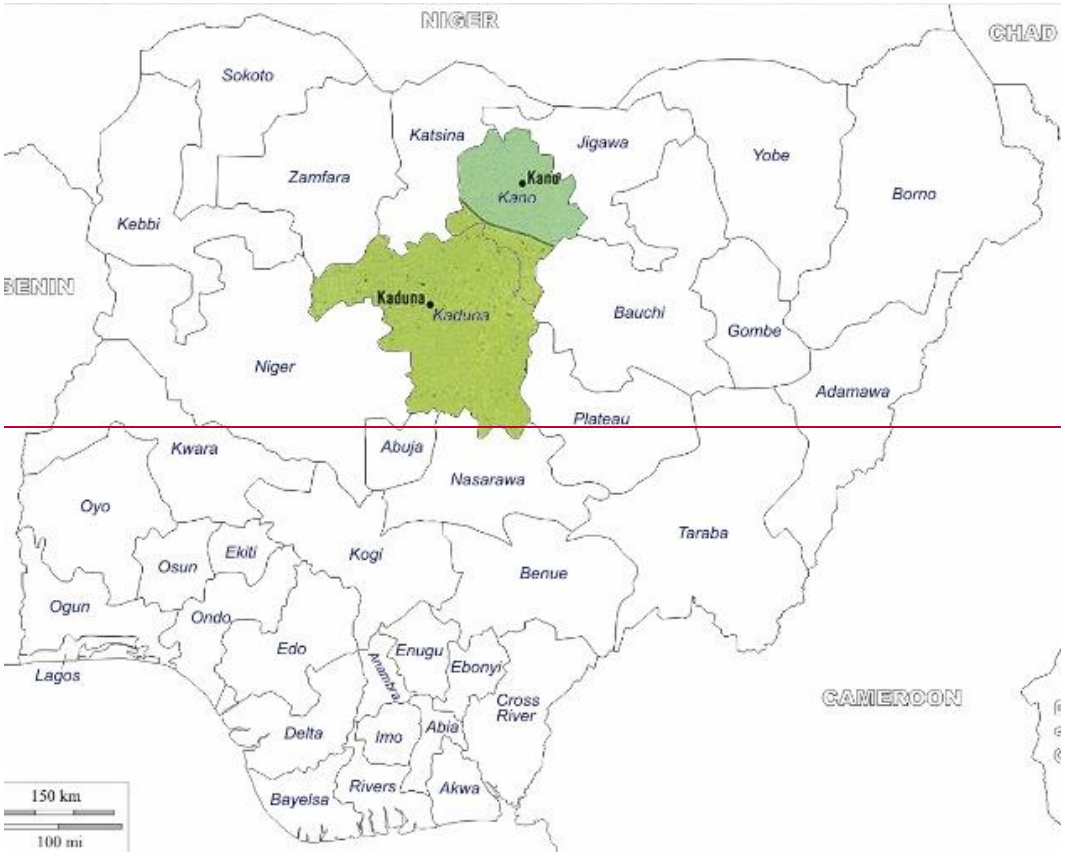
Figure 3: Map of Nigeria's vegetation zones



~~Source: http://commons.wikimedia.org/wiki/File:Nigeria_veg_1979.jpg~~

~~Nigeria is divided into different climatic regions that lie parallel to its coast. Two of these regions fall within the project area. The first region is a woodland and tall grass savannah that covers all of Kaduna state and then short grass savannah that covers most of Kano state. Of the wards selected in Kano State all are in the short grass savannah and therefore by directly comparing the two states we can examine the homogeneity.~~

~~Figure 4: Map of Nigeria states overlaid onto vegetation map~~



~~Table 6: Mean firewood consumption adjusted for seasonal changes and patterns of multiple stove use by region (kg/stove/day)~~

~~State~~	~~Mean firewood [SD]~~
~~Kaduna (n=80)~~	~~13.71 [7.09]~~
~~Kano (n=110)~~	~~14.26 [4.48]~~

~~It can be seen both state mean values are within the confidence interval and so the full surveyed area can be considered as homogeneous.~~

~~In addition, other supporting evidence of homogeneity are the similar patterns in types of fuel used for cooking, average household size and incidence of poverty. In Kaduna and Kano approximately 90.7 percent and 94.1 percent of households cook with fuelwood respectively.[74] Kaduna and Kano also share similar socio-economic characteristics such as high incidence of poverty with Kaduna at 79 percent and Kano at 73 percent[75]. Average household sizes are also similar with Kaduna at 5.3 and Kano at 5.7 people per household.[76]~~

~~[74] National Bureau of Statistics, Social Statistics in Nigeria 2009, Federal Republic of Nigeria.~~

~~[75] Nigeria, National Bureau of Statistics: Nigeria Statistical Data Portal, 2010 Data: http://nigeria.prognoz.com/Map.aspx~~

~~[76] Ibid~~

Baseline Firewood Consumption Questionnaire

Baseline Fuel Use Assessment

This survey is designed to be administered to the **primary cook** in selected households

The objective of this survey is find out how much woodfuel is used on the MAIN COOKING STOVE on a daily basis in households

Please note: Unless stated otherwise, all questions refer to general household cooking during the **present season.**

Italic text in [square brackets] are instructions for fieldworkers. This text should not be read out to respondents.

Bold underlined text should be read out to respondents as well as the questions

[IMPORTANT: Before starting the survey, please ask the respondent if she/he is the main cook in the family unit. If it is not the main cook, ask to speak to the main cook, and arrange a convenient time when she/he will be available for interview**.]**

Introduction			
READ: Good morning/afternoon, my name is _____. Thank you for making time for us. I am here today to talk to you about your family cooking practices and fuel use. If you agree to participate in this survey, we would like to ask you a few questions; it will take about 25 minutes. There are no 'right' or 'wrong' answers and the information you provide will be very useful to help use improve cooking practices. All the information will be kept private and your name will not appear anywhere publically. We will however keep it in our records so that we can contact you in future. Do you have any questions?			
	Participation criteria & participant information		
A1	Do you mostly use **woodfuel on a traditional fire or stove** for cooking in your home?	1=Yes 2=No [terminate interview]	
A2	Do you use your household cooking stove to cook commercially (use it in a small enterprise)?	1=Yes 2=No	
A3	Do you agree to participate?	1=Yes 2 = No [terminate interview]	
A4	Have you enough wood in your home to show me how much you need to cook for a whole day?	1=Yes 2 = No [terminate interview]	
A5	ID number [XX-YY-NN]		
A6	Date of interview [DD/MM/YYYY]		
A7	Start time of interview [Use 24-hour clock]		
A8	Interviewer's name		
A9	Respondent's name		
A10	Respondent's telephone number [if available]		
A11	Region / district		
A12	Group village/local community		
A13	Today's weather [to be adapted to country]	1 = Hot and dry 2 = Hot and wet 3 = Cold and dry 4 = Cold and wet 5 = Mixed	

	Household structure	
B1	How many people live in your **household** in total?	

B2	Within your **household**, do different family units or groups cook separately (for example in different locations or near each other but using separate fires or stoves				1=Yes 2 = No [*go to B5*]		
B3	How many **family units** live within your household?						
B4	How many people are in your own family unit						
B5	On average, how many people do you usually cook meals for each day, at this time of year?						
	Children 14 year or younger	Female adults 15 years and older	Male adults 15 - 59 years	Male adults 60 years or older	Total [NN] [add up B5_1 to B5_4]		
	B5_1	B5_2	B5_3	B5_4	B5_5		
B6	[Check: Is the total in B5_5 the same as B4?]			1=Yes [Go to C] 2 = No [Ask B7]			
B7	Why is there a difference between your family unit size and the number cooked for? *[Write down everything the respondent says]*						
	Cooking						
C1	On average, how many times each day do you use your stove to prepare food for your family?						
C2	What is your main type of woodstove at this time of year? *[use list below]*						
	MurhunGargajiya (three stone)	1	Kapitankiya (Metal bodied)	2	Murhumaikafauku (Tripod)	3	Other_____ 4
	Simultaneous stove use for cooking using woodfuel						
D1	Do you ever cook on more than one woodfuel stove **at the same time** at this time of year? [Make sure the respondent is not simply talking about multiple pots]				1 = Yes 2 = No [Go to Section E]		
D2	Do you do this at least once per week?				1 = Yes 2 = No [Go to Section E]		
D3	How many days each week do you use two **woodfuel** fires or stovesat the same time						
D4	How many meals do you use them for on those days?						
D5	During which seasons do you use more than one **woodfuel** fire or stove at the same time for cooking [*include as many seasons as required*]				Rainy season Post-rainy season Cold season Dry hot season All year		

	Stoves with more than one pot hole					
E1	Do you own a woodstove on which you can cook two dishes at the same time?	1 = Yes 2 = No [go to Section F]				
E2	Do you use both burners at the same time once a week or more?	1 = Yes 2 = No [go to Section F]				
E3	How many days do you use it to cook two dishes in two pots at the same time					
E4	On those days, how many meals do you use it for to cook two dishes in two pots at the same time					
E5	During which seasons do you use this stove to cook two dishes in two pots at the same *time [include as many seasons as required]*	Rainy season Post-rainy season Cold season Dry hot season All year				
	Space heating					
F1	Do you use a wood fire or woodstove for room heating at **any time of year**?	1 = Yes 2 = No [Go to Section G]				
F2	Is it the same stove as you use for cooking	1 = Yes 2 = No [Go to Section G]				
F3	Do you use it for heating when not cooking?	1 = Yes 2 = No [Go to Section G]				
F4	During which seasons do you use a wood fire or woodstove for room heating? *[include as many seasons as required]*	Rainy season Post-rainy season Cold season Dry hot season All year				
	Additional uses of fires/stoves					
G1	At this time of year do you use **woodfuel** fires or stoves for purposes other than cooking and heating your house at least once per week? [Get the respondent to list all the **other** tasks for which they use **woodfuel** and the frequency of the task. If one or more task is not listed, use boxes G1.4 and G1.5.					
	No other purpose	1	Heating water	2	Burning incense	3
	Brewing tea	4	Cassava drying	5	Ironing	6
	Roasting	7	Drying meat	8	Other [describe]	9
	Use [use coding]		Number of days per week?			
G1.1						
G1.2						
G1.3						

	[Record any other tasks that are not on the list]					
G1.4						
G1.5						
	Woodfuel					
	[This question is very important – please take time to ensure the question is understood and your measure reflects wood used for the respondents**family unit** in an **average day]** **Ask:** How much woodfuel do you use in an **average day**? Please make a pile for me to weigh. [If the respondent uses a large log over a few days, ask them to pile up the equivalent wood used in a day]					
J1	[Weight of **woodfuel** including bag or binding ***[****Include decimal places]***					__ __ __ . __ __Kg
J2	[Weight of bag/binding weighed without the woodfuel]					__ __ __ . __ __Kg
J3	[Did you weigh all the woodfuel available in the household, or was some left besides that weighed?]	1= Weighed all available woodfuel 2= More wood remained				
J4	Do you buy **any** of your woodfuel?	1 = Yes 2 = No (go to section K)				
J5	About what proportion of total wood used do you buy at this time of year?	1 = I buy most of my fuel 2 = I buy about half my fuel 3 = I buy a small amount of fuel				
J6	How much do you spend each time you buy **woodfuel**?					MWK
J7	How many days would this amount of **woodfuel** last					days
J8	[Add any other observations that you think are relevant about the woodfuel used by this family]					
	Other fuels					
	How much of your cooking is done with the following fuels at this time of year? [*Ask about each fuel in turn and circle the most appropriate response*]					
		None	Less than one meal per week	A few meals per week	About half of all cooking	More than half of all cooking
K1	Dung	1	2	3	4	5
K2	Charcoal	1	2	3	4	5
K3	Kerosene	1	2	3	4	5
K4	LPG [gas]	1	2	3	4	5

K5	Crop residues	1	2	3	4	5
K6	Other [*describe]* _____	1	2	3	4	5

[Check with the respondent that you have discussed all of the fuels the household uses for cooking]

S. Seasonality

Season codes	Rainy season	Post-rainy season	Cold season	Dry hot season
	A	B	C	D

S1 How would you describe the current season? [Read names of seasons from list above and enter code]

S2 Ask: Over which months does each season occur?

[Mark the calendar below using the letter codes above, putting one letter only in each box – e.g. if rainy season lasts from August to December, put an A in each box for August to December – similarly for each season]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Ask: How doeach of these factors changewith seasoncompared tothe current season**?**

[*Ifthings change,put'1* 'in the second column, and fill in the sentences in the third column. *Ifit does not changeput'2* 'in the second column and do not fill in the third column.]

	Factor	Does it vary? 1=yes 2=no	[IF YES go through all seasons with participants and record how the factors changes]
S3	Number of **people** for whom meals are cooked	S3_1	In Rainy season I usually cook for [.....S3_2] people In Post-rainy season I usually cook for [.....S3_3] people In Cold Season I usually cook for [..... S3_4] people In Dry Hot season I usually cook for [.....S3_5] people
S4	Number of **meals** cooked per day	S4_1	In Rainy Season I usually cook [.....S4_2] meals / day In Post-rainy season I usually cook [..... S4_3] meals / day In Cold season I usually cook [..... S4_4] meals / day In Dry Hot season I usually cook [..... S4_5] meals / day
S5	Main **type of fuel** used for cooking	S5_1	In Rainy Season the fuel I generally use is [.....S5_2] In Post-rainy season the fuel I generally use is [

	[use list below]		.....S5_3] In Cold Season the fuel I generally use is [.....S5_4] In Dry Hot Season the fuel I generally use is [..... S5_5]

	Wood =1	Charcoal=2	Crop residues=3	Kerosene=4
	LPG=5	Wood/ crop residues in equal quantities=6	Other=7	

S6	[If answered yes to S5_1] Why do you use another fuel to replace wood fuel during other seasons?	1 = Wood to wet to burn 2 = It can be used indoors 3= Wood too expensive/scarce 4= Crop residues are available 5= Other [describe]	

S7 READ using the diagram on separate sheet: Here is a diagram showing the amount of woodfuel you use currently each day *[point to the all-black circle]*. If this cross is 'no fuel at all' *[point to the cross]* and this big circle is 'twice as much woodfuel as you use now' *[point to the largest circle]* please show us the amount of woodfuel you think you would use in EACH season.

[First **underline** the current season in the column below and circle number 5;

THEN circle the number that refers to the amount of woodfuel the participant indicates **for each season**]

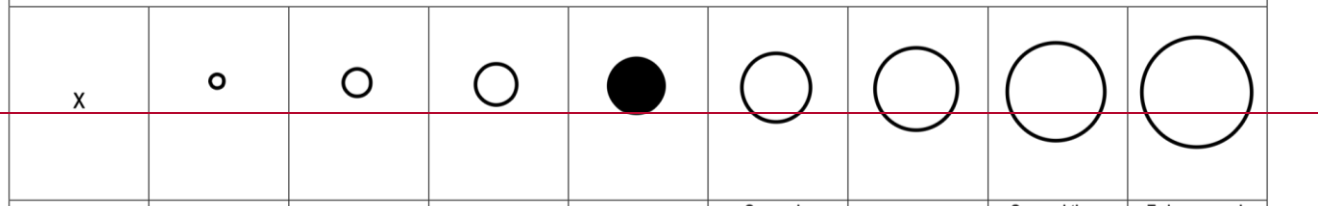
	Underline current season in column below	No woodfuel	Quarter	Half	Three quarters	Current	One & quarter	One & a half	One & three quarters	Twice as much woodfuel
S7_1	Rainy	1	2	3	4	5	6	7	8	9
S7_2	Post-rainy	1	2	3	4	5	6	7	8	9
S7_3	Cold	1	2	3	4	5	6	7	8	9
S7_4	Dry Hot	1	2	3	4	5	6	7	8	9

	N. Other observations
N1	Is there anything else you would like to tell us about how you use your fuel for household purposes? [*Write down everything the participants says*]
	Thank you for your time and help in providing us with this useful information

~~N2~~	~~[Write down any observations of your own that you feel would be helpful and relevant]~~

~~Proportional seasonal fuel change diagram~~

READ: Here is a diagram showing relative sizes, with the amount of wood you currently use each day *[point to the all-black circle]*. If this cross is 'no fuel at all' *[point to the cross]* and this big circle is 'twice as much wood as you use now' *[point to the largest circle]* please show us the amount of wood you think you would use in the XXX season [work through all seasons other than the current and record responses on survey form].



No wood	Quarter	Half	Three quarters	Current	One and a quarter	One and a half	One and three quarters	Twice as much wood
1	2	3	4	5	6	7	8	9

~~Calculation of adjustment for seasonal fuel use~~

~~The participants were asked 'How would you describe the current season?' and 'When does each season fall in the year?' This information was used to calculate the length of the current season and the 'other' seasons for each participant.~~

~~The participants were asked how much firewood they use in the 'other' seasons compared to their current use (see question M6.1 in Annex 6.2/6.3). Each response provided a fraction related to the current firewood use as per the table below.~~

~~Relative amount of firewood~~	~~Adjustment fraction~~
~~No firewood~~	~~0~~
~~A quarter of the amount~~	~~0.25~~
~~Half of the amount~~	~~0.5~~
~~Three quarters of the amount~~	~~0.75~~
~~No change~~	~~1~~
~~A quarter more~~	~~1.25~~
~~A half more~~	~~1.5~~
~~Three quarters more~~	~~1.75~~
~~Double the amount~~	~~2~~

~~The current daily firewood consumption was multiplied by this fraction to give a daily amount during the 'other' seasons.~~

~~For example: If the HH currently using 10.08kg of fuel per day reported using a quarter more during the 'other' season, the daily fuel consumption for the 'other' season was calculated by:~~

~~10.08*1.25= 12.6kg~~

~~The overall daily firewood consumption was adjusted to reflect the reported length of the current season and that of the 'others'. For example, if the participant said the current season was 'rainy' and it carried on for 4 months of the year and the 'other' season was 'dry' which lasted 8 months the following calculation was applied:~~

~~((10.08*4)+ (12.6*8))/12 = 11.76 kg/day~~

Adjusting for prevalence of simultaneous multiple stove use in future monitoring

The following formula is proposed by CQC for calculating the $B_{old,adjusted}$ to account for different prevalence of significant levels of simultaneous stove use compared with that determined at baseline:

$$B_{old,adjusted} = B_{old} \cdot \left[\frac{1.23}{1 + (SS_y/0.51) * (1.23 - 1)} \right]$$

where:

B_{old} is the baseline value presented in this report after adjustment for seasonal variation and multiple stove use *as determined at baseline;*

SS_y is the percentage of households that continue to use baseline stoves (second stoves) at least once week in addition to ICS *as determined at monitoring*;

0.51 is the percentage of households in the baseline study who use a second stove at least once per week;

1.23 is the mean multiple stove adjustment factor calculated as follows:

$$Multiple\ stove\ adjustment\ factor = \frac{B_{old\ adjusted\ for\ seasons\ and\ multiple\ stove\ use}}{B_{old\ adjusted\ for\ seasons}} = \frac{17.23}{14.01} = 1.23$$

The multiple stove use adjustment factor is calculated by dividing the fuel consumption levels (only adjusted for seasonal variations in fuel consumption) in each household by the average number of simultaneous stove use in each household to come up with a fuel consumption value adjusted for simultaneous multiple stove use at the household level. The mean "unadjusted" fuel-consumption (only adjusted for seasonal fuel-use patterns, but not for second stove use) is divided by the mean adjusted household fuel-consumption to come up with the adjustment factor for the entire sample. Note that this is slightly different from taking the mean simultaneous stove use and applying it to the "unadjusted" fuel-consumption mean.

Calculation of simultaneous stove use

This section outlines the process of gathering and analysing information on simultaneous stove use in Kaduna and Kano states as part of the baseline assessment.

The survey provides the following information:

- Average number of meals cooked per week
- Average number of 1 stove meals cooked per week
- Average number of 2 stove meals cooked per week.
- Average number of months per year this occurs

Using this information and assuming equal amounts of fuel used on each stove (which is the most conservative approach), the fuel correction factor is calculated as follows:

(2*total meals per week with 2 stoves)+total meal using 1 stove= stove meals

Stove meals/7= stove meals per day

Stove meals per day/number of meals per day= Household (HH) mean stoves used /day

Fuel correction factor= 1/ (HH mean stoves used /day)

The table below shows the calculations for various combinations of simultaneous stove use.

Total meals/week	Total meals with 2 stoves	Total meals with 1 stove	Stove meals total	Stove meals/day	HH mean stoves used per	Fuel correction factor

	/week	/week	/week		day	
21	21	0	42	6.00	2.00	0.50
21	18	3	39	5.57	1.86	0.54
21	14	7	35	5.00	1.67	0.60
21	10	11	31	4.43	1.48	0.68
21	7	14	28	4.00	1.33	0.75
21	4	17	25	3.57	1.19	0.84
21	1	20	22	3.14	1.05	0.95
21	0	21	21	3.00	1.00	1.00
14	14	0	28	4.00	2.00	0.50
14	12	2	26	3.71	1.86	0.54
14	10	4	24	3.43	1.71	0.58
14	8	6	22	3.14	1.57	0.64
14	7	7	21	3.00	1.50	0.67
14	4	10	18	2.57	1.29	0.78
14	3	11	17	2.43	1.21	0.82
14	2	12	16	2.29	1.14	0.88
14	0	14	14	2.00	1.00	1.00

These adjustments are further refined according to seasonal variation. Based on the wet season lasting three months and the dry lasting nine months, adjusted fuel consumption for a HH reporting multiple stoves during the dry season but not during the wet season would be calculated as follows:

((3*1) + (1*fuel correction factor))/4

Example

Total meals per week: 21 Total 1 stove meals: 17 Total 2 stove meals: 4

Daily HH firewood use: 12.32kg

Calculation

(2*4)+17= 25

25/7= 3.57 stove meals per day

3.57/3 meals per day= **1.19 stoves per day**

1/1.19= a fuel correction factor of 0.84

Therefore a HH with a daily firewood use of 2.32kg would be adjusted to

12.32*0.84 = 10.35kg of firewood used per day per stove.

If this HH only used multiple stoves in the wet season this would be adjusted to:

((3*1) + (1*0.84))/4 = 0.88

Any HH reporting simultaneous stove use less than once per week was given a default adjustment factor of 1.

Appendix 5. Further background information on monitoring plan

Not applicable.

Appendix 6. Summary report of comments received from local stakeholders

Please refer to Section F of the document for stakeholder's comments.

Appendix 7. Summary of post-registration changes

Via PRC-6283-001, the following permanent changes were made in PoA-DD.

(i) Corrections: Correction was made in PoA-DD to reflect the extended geographical boundary of Kano State and due to the switch of PoA DD template.
(ii) Changes to programme boundary to expand geographical coverage: Kano State was added to the PoA boundary along with Kaduna State, Nigeria.
(iii) The coordinating/managing entity has updated the eligibility criteria for inclusion of CPAs in the PoA to reflect the changes due to additional geographical boundary of Kano State.

Via PRC-6283-002, the following changes were made in PoA-DD.

1. The following has been changed from registered monitoring plan:

    a) During the registration, the sampling method applied in the monitoring plan is multi-stage sampling. Multi-stage sampling is a sophisticated method which is not easy to be implemented and the data analysis is difficult. Given that the population being studied is relatively homogeneous with respect to the parameter being studied, therefore simple random sampling is chosen to replace the existing sampling method. Accordingly, sampling frame, sampling method and sample size calculation of monitoring plan is revised with information correlated with simple random sampling.

2. The following corrections have been done in the PoA-DD:

    a) In Part 1 Section C, edit is made on the procedure to avoid double counting and record keeping system for each CPA under the PoA. Information and Communication Technologies ('ICT' – such as PDAs) is added as one of the options under electronic means for gathering information from stove end user.
    b) In Part II Section B.7.1 has been updated to provide additional clarification on the options available in electronic means when collecting end user information.

Current Changes

1. Changes to Programme Design

i- Changes to Programme Boundary- the programme boundary has been expanded within Host country to cover entire Nigeria instead of just Kano and Kaduna. Accordingly, concerned sections have been updated. The CME intends to extend the PoA for entire Nigeria.

ii- Application of paragraph 124 (m) of CDM project standard for programme of activities, version 02.0 resulting in change in relevant sections of the PoA DD. This change is in line with EB 86 which introduced the applicability of micro-scale threshold at unit level, for CPAs qualifying under paragraph 12[77] of Tool 19.

iii- Changes in the eligibility criteria- eligibility criteria nos 2,4, & 16 have been revised owing to change in programme boundary and application of micro scale threshold at unit level. Change in applicability criteria no 6 owing to use of latest version of applied methodology. Addition of applicability criteria 3,12, 14 & 15 to comply with the requirement of paragraph 124 of CDM standard for programme of activities, version 02.0. These changes are required to make the sections of PoA DD consistent amongst one other.

2. Permanent changes to registered monitoring plan.

i. Definition of Primary sampling unit for parameter - proportion of ICS still in operation ($N_{y,i}$) has been revised. As the use of project stove is not dependent on CPA implementer or the model, hence these factors are now not required to be considered for defining the primary sampling unit for $N_{y,i}$

ii. Parameters; μ_y- Adjustment to account for any continued use of pre-project devices and $B_{y=1,new,i,\ survey}$ - Quantity of woody biomass used by project devices in tonnes per device, have been added as a result of application of latest version of methodology accordingly the primary sampling units of these two parameters have now been defined in the monitoring plan.

3. Corrections

~~i.~~ Swedish Energy Agency has been added as participant in section A.5 and Appendix 1 to comply with MoC.

i.

ii. Additions owing to change of template as well as editorial changes.

Impact of proposed changes on

a. *The applicability and application of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents, with which the PoA or CPA has been registered or included* – as a result of application of para 124 (m) of the CDM standard for PoA; version 02, methodological tool- "Demonstration of additionality of microscale project activities", version 09.0 is now applied for demonstrating additionality.

b. *The compliance of the monitoring plan with the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;* - there is no change in compliance of the monitoring plan with respect to applied methodology

[77] Applicable for energy efficiency projects

c. *The level of accuracy and completeness in the monitoring of the PoA or the CPA compared with the requirements contained in the registered monitoring plan*; - change in definition of primary sampling unit for parameters Ny,j and µy will not affect the accuracy and completeness in the monitoring as compared to the registered PoA DD.

a. *The additionality of the PoA or CPA;* - please refer to point number (a)

b. *The scale of the CPA;* - with the application of para 124 (m) of PS PoA, the CPAs which were bound by small scale threshold under registered PoA are no longer required to demonstrate their adherence to small scale threshold.

The eligibility criteria for inclusion of CPAs in the PoA. – eligibility criteria 2,3, 4,12,14,15 and 16 have been revised

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Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	28 June 2017	Revision to: • Remove a duplicated instruction; • Make editorial improvement.
08.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and CPA-DD forms; • Make editorial improvement.
07.0	25 May 2017	Revision to: • Ensure consistency with the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Programme design document form for small-scale CDM programmes of activities" (CDM-SSC-PoA-DD-FORM); • Make editorial improvement.
06.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).

Version	*Date*	*Description*
05.0	9 March 2015	Revision to: • Include provisions related to choice of start date of PoA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Add exception for generic CPA where technology is under positive lists; • Make editorial improvement.
04.1	5 August 2014	Editorial revision to correct the document information table.
04.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM programme of activities (these instructions supersede the Guideline: Completing the programme design document form for CDM programme of activities (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the PoA in B.4 and Appendix 1; • Add general instructions on post-registration changes in paragraphs 2 and 3 of general instructions and Appendix 6; • Change the reference number from F-CDM-PoA-DD to CDM-PoA-DD-FORM; • Make editorial improvement.
03.0	3 December 2012	EB 70 Revision to reflect changes to the *Guideline: Completing the programme design document form for CDM programmes of activities* (EB 70, Annex 6).
02.0	13 March 2012	EB 66 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities" (EB 66, annex 12).
01.0	27 July 2007	EB 33, Annex 41 Initial publication.

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