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

CONTENTS

Annexes

NOTE:

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

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

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

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

Fuel Efficient Stoves in Zambia

Version 6.2
07/01/2013

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

1. General operating and implementing framework of PoA

The proposed small scale PoA involves the distribution of fuel-efficient stoves by 3 Rocks Ltd. (3RL) in individual households in Zambia, as described in each of the PoA's CDM Programme Activity Design Documents (CPA-DD) and according to the requirements of the appropriate small scale methodology: AMS II.G *Energy efficiency measures in thermal applications of non-renewable biomass, Version 3*. The efficient stoves are based on a design commissioned by 3RL and will be installed by 3RL for recipient households in exchange for certain labour and materials during installation. The stove design was tested independently in accordance with the *"Stove Manufacturers Emissions & Performance Test Protocol (EPTP)"*[1] and certified by the Engines and Energy Conversion Laboratory at Colorado State University to determine its thermal efficiency. More information on this test and the procedures followed is available in Annex 3.. It is the revenue from the sale of CERs only that will fund the installation process. 3RL is the Coordinating/Managing Entity (CME) for the PoA.

Traditionally, the majority of Zambian families cook on an open fire, utilizing the 'three rocks' method for heating pots. This method is inefficient and leads to the unsustainable use of non-renewable biomass in the process. The replacement fuel-efficient stove will lead to a reduction in the annual usage of biomass for users by approximately 66%. The majority of Zambians do not have access to the market for fuel-efficient cooking stoves, mainly for economic reasons. Utilizing carbon finance, the proposed PoA aims to overcome this barrier to market entry for households, substituting three rock fires for fuel-efficient stoves.

Recipient households will sign an agreement acknowledging that 3RL is the owner of the rights to the emissions reductions generated by the stove and agreeing for the stove to be included in the monitoring programme as described in this PoA-DD and the relevant CPA-DD. The benefits of the stove and various user commitments will be clearly explained to prospective users during communication events at the CPA implementation stage.

The stove "liner" consists of a standardized, alloy metal combustion chamber, with an insulating layer surrounding it. Stove liners will be manufactured, imported and distributed to local Zambian teams responsible for stove installations within each CPA. The installation teams will then build a brick enclosure to secure the liner *in situ*. Materials, such as those required for the brick enclosure, will be

[1] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

manufactured locally to each CPA and household recipients will be involved in the construction process by advising on the preferred location of the stove and providing certain materials for its installation.

Installation teams will be appointed to install the stoves according to a uniform installation process and they will be trained to build each stove to a pre-determined design, eliminating variation in performance. Installers will also be trained to capture monitoring data from the installation process indentifying each stove by owner name and/or government identification number, address or location, and GPS location reference. Each stove will be assigned a unique reference number in an electronic data management system, or monitoring database.

Data collected during the installation process stoves will be captured on electronic handheld devices and uploaded to the monitoring database. This database will be maintained locally in Zambia and backed-up securely offsite. A hardcopy back-up of the emissions rights acknowledgement will also be collected at the installation phase. This system will be available for review by the Designated Operational Entity (DOE) during verification of the PoA.

3RL has completed stakeholder consultations at the PoA level, including national awareness raising meetings, regional meetings and user trials of prototype stoves. It is, furthermore, the intention of 3RL to run an ongoing, post-registration programme of awareness-raising of the optimal usage of the stove, allowing a further mechanism for feedback on its performance from recipients.

A monitoring programme will be conducted at the PoA-level to determine the emissions reductions generated by the stoves during every monitoring period. This will be summarized in a monitoring report, including the emissions reduction calculations.

The PoA is funded entirely by private investment and does not form a part of any government-funded or supported programme in Zambia.

2. Policy/measure or stated goal of the PoA

The goal of the proposed PoA is to install fuel efficient cooking stoves throughout Zambia. The stoves will replace wood-fired, 3-rock fires only. The stoves will help recipient households reduce their non-renewable wood use, protect standing forests, and will help limit valuable time spent gathering fuel wood. Greenhouse gases will be mitigated by reducing the harvesting of non-renewable biomass for use in cooking purposes.

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

This PoA is a voluntary action, which will be implemented by 3RL. There is no law or policy in Zambia that mandates the use of fuel-efficient stoves.

4. Contribution to sustainable development

The proposed PoA contributes to the sustainable development of the Zambian economy in a number of ways:

i. Environmental
   - The PoA will help significantly reduce Zambia’s greenhouse gas emissions over its lifetime

- The PoA will help reduce the use of non-renewable biomass from Zambian forests, assisting the maintenance of existing forest stock, protecting natural forest eco-systems and wildlife habitats[2]
- The protection of standing forests will ensure the maintenance of watersheds that regulate water table levels and prevent flash flooding[3]

ii. Social

- Considerably less time will need to be spent collecting wood fuel for the family home thereby reducing the work burden on families and presenting alternative opportunities for economic development
- Cooking and heating with solid fuels on open fires or traditional stoves results in high levels of indoor air pollution. Indoor smoke contains a range of health-damaging pollutants, such as small particles and carbon monoxide[4]. Less carbon dioxide, carbon monoxide and particulates will be emitted by the fuel-efficient stove due to the decrease in total biomass burned, the increase in the efficiency of biomass burning and an increased fire temperature.
- The stove provides a safer method for combusting biomass for cooking, helping to reduce burn injuries, especially for children, in the family home

iii. Economic

- The PoA will help develop a section of the Zambian economy; in the installation of the stoves (including certain materials production; e.g. bricks and mortar) and monitoring activities.
- The PoA will bring employment benefits to Zambia and jobs will be created for its administration

The proposed PoA will deliver a long-term and secure contribution to sustainable development in Zambia that, without carbon finance, would not exist.

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

Name of Party Involved ("Host" indicates a host Party)	Private and/or Public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (yes/no)
Zambia (Host)	3 Rocks Ltd. (3RL)	No

3RL is a private entity and will act as the managing entity of the PoA.

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

A.4.1. Location of the programme of activities:

Zambia

[2] http://www.illegal-logging.info/approach.php?a_id=54

[3] http://www.meted.ucar.edu/hazwarnsys/ffewsrg/FF_EWS.Chap.2.pdf

[4] http://www.who.int/indoorair/en/

A.4.1.1. Host Party(ies):

Zambia

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary for the proposed PoA is the country of Zambia. All CPAs included in the PoA will be implemented in Zambia. The Republic of Zambia, lies within the latitude and longitude of 15 00 S and 30 00 E[5]. The approximate GPS coordinates derived from Google Earth for the furthest extremities of the Zambian border are:

North (border with Tanzania and DRC):	08º12'11.83" S & 30º46'22.26" E
South (border with Zimbabwe):	18º04'34.03" S & 26º41'47.24" E
East (border with Malawi):	10º33'43.01" S & 33º42'08.00" E
West (border with Angola):	14º33'34.57" S & 21º59'58.74" E

Figure 1: Zambia - the geographical boundary of the proposed PoA

The Zambian National Policy on the Environment (2007) indicates areas where Zambian policy is not adequately protecting environmental resources, including:

- widespread forest clearance and degradation
- forest degradation leading to reduced biodiversity
- fuel-wood demand increased and alternative energy not given sufficient attention at all levels
- Policy failure to invest more in increased access to electricity and insufficient attention and investment in low-cost alternative supplies, to offset pressure upon wood resources

[5] http://wwp.greenwichmeantime.co.uk/time-zone/africa/zambia/map.htm

- Inadequate attention in both use and regulation of the main sources of supply of energy, hydro-power and fuel-wood, to their environmental impacts and requisite amelioration in sectoral policies
- The pace of rural electrification is too slow thus compounding the pressure upon wood resources in proportion to the rapid increase in the human population

Furthermore, the policy seeks to encourage 'implementation strategies' that will: "focus more on establishing an enabling environment to promote community-based sustainable natural resource use and less on traditional government managed development projects."

The National Energy Policy (2008), states: "Although there is no immediate woodfuel crisis in most parts of Zambia, woodfuel can no longer be considered as a renewable resource because consumption rates are exceeding yield rates mainly as a result of inefficient production and use and the increasing population… If current trends of woodland depletion continue an "energy crisis" that will affect the majority of the people is likely to occur in the near future. This is in addition to desertification, which is already threatening some parts of the country."

In addition, under policy measures and strategies for household energy, the National Energy Policy seeks to "promote the use of efficient cook stoves" through "innovative financing schemes designed to reduce the initial cost problem for low income households."

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

Each CPA will involve the installation of a maximum of 180GWh of stove thermal savings in recipient households (this is the AMS IIG limit as clarified by the SSC WG on 04/11/2008[6]) and this will translate to a maximum number of stoves per CPA. The efficient stoves will replace traditional wood-fired, three rock fires in households where they are present. CPAs will not be limited geographically to individual villages or towns. Each CPA will comprise the manufacture, installation and monitoring of the stoves over the CPA crediting period.

3RL will employ manufacturers to produce the components for the installation of each stove. These components will then be distributed to each CPA via a central location, where installation teams will be responsible for the assembly of each stove.

Each installation team will be trained to build each stove, in partnership with the stove recipient, to a uniform design and will be responsible for ensuring that data is captured at installation to ensure the accurate monitoring of emissions reductions during each PoA monitoring period.

Recipient households will sign an agreement acknowledging that 3RL is the owner of the rights to the emissions reductions generated by the stove and agreeing for the stove to be included in the monitoring programme as described in this PoA-DD and the relevant CPA-DD. Installation data will be captured and recipient households will then receive an installed stove and training on its use.

The installed stoves will have GPS reference coordinates logged and given a unique reference number in the monitoring database. Monitoring of emissions reductions will take place as a group of CPAs.

[6] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_VIIC5MTUUWR9PRPJL0EXOT3G2CKSFQ

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

The PoA will provide energy efficient cooking stoves based on the 'rocket stove' design. This technology ensures a 29.5% thermal efficiency against the 10% methodology default for the traditional 3-rock fire.

The stove consists of a durable metal alloy liner, with an insulating layer surrounding it. The liner and insulation are encased in a metal outer container, which is further attached to brick enclosure for protection and security. The liner is tapered at the top, where a galvanized cooking surface provides a rest for the cooking pot. The flame is directed onto the pot speeding up the flow of gases from the combustion chamber and the biomass fuel is supported using a metal grate to ensure adequate air flow to the fire. The whole stove is cemented to the floor ensuring the stove is largely protected from damage and theft.

Stove alloy liner

Constructed Stove

Figure 2: Stove design

The fuel-efficient cooking stove technology has been tested independently in accordance with the *"Stove Manufacturers Emissions & Performance Test Protocol (EPTP)"*[7] and certified by the Engines and Energy Conversion Laboratory at Colorado State University[8] for its thermal efficiency. More information on this test and the procedures followed is available in Annex 3.

The liner, insulation, pot rest and metal grate will be manufactured in a specialist stove factory to ensure standardised production. All other components, including bricks and mortar, will be produced locally in Zambia.

The stove will be constructed according to a standardized design and construction procedure by Zambian installation teams. Teams responsible for the construction of stoves in each CPA will be trained accordingly. The trained stove builders will receive a stove kit that they assemble on site. A separate Operations Plan and Installation Process details how individual households will receive stoves and the timescale for each CPA's implementation.

[7] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

[8] Please see EECL "Statement of Qualifications"

The replacement of the fuel efficient stoves, described above, for a more efficient version will only be possible if the crediting period of the PoA is renewed at the end of the existing crediting period. A more efficient stove will require the baseline data to be changed and this will require additional validation. The technology described above is state-of-the-art and designed as a bespoke solution for Zambia. A more efficient technology would require considerable additional research and development over a period of time.

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

In accordance with the Standard for the development of eligibility criteria (EB70, Annex 5), the following criteria must be met by each CPA to ensure its eligibility under the PoA:

No.	Eligibility Criteria	CPA Application	Document Reference
a)	The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA	The geographical boundary of the CPA will be consistent with the PoA-DD: the country of Zambia. There is no relevant time-induced boundary to the proposed PoA or its CPAs, consistent with this geographical boundary.	CPA-DD & Installation database records
b)	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo)	Double-counting of emissions reductions will be avoided by the unique referencing of stoves included in the CPA. This will be achieved through: – ***GPS references*****:** each stove will have a unique GPS-referenced location. During the verification process the DOE will be able to check the existence of stoves related to this GPS location reference. – ***Name, location and/or ID number*****:** an additional check of double-counting may be made against the household name, location and/or Zambian government ID number of the stove recipient ascribed to each stove. This may be checked physically during the verification process. – ***Unique reference numbers*****:** each stove will also have a unique reference number in the monitoring database. Only one stove will be installed per household. The DOE will be able to check this during the verification process.	CPA-DD & Installation database records
c)	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;	1) *Level of Service*: Each CPA will provide energy efficient cooking stoves based on the 'rocket stove' design. This will deliver a level of service equivalent to the baseline 3 rock fire by enabling cooking, water	CPA-DD & manufacturer test certificate

		heating and space heating services to the household 2) *Type of service*: The technology delivers a baseline thermal efficiency of 29.5% against the 10% methodology default efficiency for the traditional 3-rock fire. Therefore, according to the baseline test data, the technology delivers the same type of service, except with an annual thermal energy saving ranging from GWh 0.01123-0.01137[9] per stove against the 3-rock fire. The technology has been tested independently in accordance with the *"Stove Manufacturers Emissions & Performance Test Protocol (EPTP)"*[10,11] and certified by the Engines and Energy Conversion Laboratory at Colorado State University for its thermal efficiency.	
d)	Conditions to check the start date of the CPA through documentary evidence;	The starting date of the proposed CPA will be the date of commencement of 'real action' in the CPA. This date will be selected as the date when the first stoves are ordered under the CPA. The evidence will be the date on the relevant stove purchase order.	Relevant stove purchase order
e)	Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPAs;	CPAs will comply with the small scale methodology AMS II.G version 3	CPA-DD & emissions reductions calculation sheet
f)	The conditions that ensure that the CPA meets the requirements pertaining to the demonstration of	CPA's will demonstrate additionality by applying Paragraph 2 (c) of Annex 27 of EB 68: GUIDELINES ON THE	1. Installation database will only

[9] Range of thermal efficiency from baseline test (See Annex 3) = 29.2-29.9%

By Savings Range: 4.1*(1-0.1/0.292) : 4.1*(1-0.1/0.299) = 2.70-2.73

GWh savings range (NCV Biomass*By Savings): (0.004167*2.70) : (0.004167*2.73) = 0.01123-0.01137

[10] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

[11] The Stove Manufacturers Emissions & Performance Test Protocol (EPTP) updates the Water Boiling Test (WBT) protocol version 3.0 by Balis et. al. and provides a standardized protocol for measuring and comparing cook stove performance. The EPTP is an approximation of real world cooking processes, which can be conducted on most stoves throughout the world. By using measured thermal efficiencies and emissions productions, the WBT can be used to roughly predict the performance of stoves for various cooking tasks.

	additionality	DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES. Each CPA will demonstrate: 1. Program will be solely composed of isolated units 2. Users of the technology/measure are households 3. Size of each unit will be under 3000 MWh of energy savings per year 4. Size of each unit is no larger than 5% of the small-scale CDM thresholds	include isolated units 2. Installation database will only include households 3. Emissions Reductions Calculation Sheet (v3) 4. Emissions Reductions Calculation Sheet (v3)
g)	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;	Stakeholder consultations and environmental impact assessment are demonstrated at the PoA-level	PoA-DD
h)	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance;	CPAs will affirm that there will be no funding obtained from Annex 1 parties.	3RL company accounts
i)	Where applicable, target group (e.g. domestic /commercial /industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation);	Proposed CPAs involve the distribution of domestic fuel-efficient stoves by 3 Rocks Ltd. (3RL) in Zambia. The efficient stoves are based on a design commissioned by 3RL and will be directly installed by 3RL for recipient households in exchange for certain labour and materials during installation.	CPA-DD & Installation database records
j)	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities"	Due to the homogenous nature of CPAs, sampling of CPAs will be undertaken as a group in accordance with the methodology and the Standard	CPA-DD & Sample Size Calculation Spreadsheet
11	Where applicable, the conditions that ensure that every CPA (in aggregate if it comprises of independent sub units) meets the small-scale or microscale threshold and remains within those	CPAs will not exceed the methodology threshold for AMS II.G of 180GWh[12] per annum.	CPA-DD & Stove Installation Database

[12] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_VIIC5MTUUWR9PRPJL0EXOT3G2CKSFQ

	thresholds throughout the crediting period of the CPA;		
12	Where applicable, the requirements for the debundling check, in case the CPA belongs to small-scale or microscale project categories	CPAs will apply a de-bundling check in the CPA-DD for assessment at the time that the CPA is included in the PoA.	CPA-DD

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

The proposed PoA will reduce GHG emissions through the installation of fuel efficient stoves that reduce the total quantity of non-renewable biomass used by each recipient household for domestic purposes. The PoA is additional as it relies solely on carbon finance to ensure its implementation. There are no other sources of revenue from the project other than from the sales of issued Certified Emissions Reductions (CERs). There is no other incentive to undertake the PoA, nor is there any regulation in Zambia mandating this activity.

Technology Transfer:

The technology being employed has been commissioned by, and specifically designed for, 3RL to implement in the proposed PoA, meeting the unique requirements for Zambia. The technology was originally designed in the USA and is transferred from that Annex 1 country. It is robust and secure, significantly more efficient than the traditional method of cooking and culturally acceptable for users. This is all demonstrated in the baseline and stakeholder assessment data presented in this PoA-DD. In this way, a state-of-the-art, bespoke-designed technology is being transferred from an Annex 1 country to a non-Annex 1 Least Developed Country (LDC).

Prior Consideration of the CDM:

It may be demonstrated that the CDM was considered prior to the PoA's start date as an initial Global Stakeholder Consultation was undertaken prior to the starting date of the PoA. The starting date of the proposed PoA is 22/12/2010, which is the starting date of the first CDM programme activity. The initial PDDs were submitted to the UNFCCC's Global Stakeholder Process on 24/11/2010. In this way, the starting date of the programme activity is after the starting date of validation, giving clear evidence proving that incentive from the CDM was seriously considered in the decision to proceed with the programme activity.

(i) The proposed PoA is a voluntary coordinated action:

There is no mandated government programme or policy in Zambia ensuring the distribution of domestic fuel-efficient cooking stoves. Recipient households may only participate voluntarily in the Fuel Efficient Stoves in Zambia PoA. It is hereby confirmed that the proposed PoA is a voluntary coordinated action by 3RL.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA:

In the absence of the proposed PoA, the distribution of domestic fuel-efficient cooking stoves would not be undertaken. The implementation of the PoA relies solely on the revenues gained from the sale of its issued CERs. There are no other identifiable revenue streams from the PoA and therefore, the revenue from the sale of CERs was considered at the earliest stage of the PoA's development, as, without this revenue stream, project finance could not be sought.

Additionality Assessment:

The assessment of the PoA's additionality is addressed in accordance with applying paragraph 2 (c) of Annex 27 of EB 68: GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES:

> Documentation of barriers, as per paragraph 1 above, is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:
>
> *Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds*
>
> *1 That is the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.*

Projects applying the small-scale methodology AMS IIG v3 have a threshold of 180GWh maximum thermal energy savings per annum.[13] As stated in the eligibility criteria, each CPA will not exceed this threshold. The GWh savings per stove per year in the proposed project is 0.011 and this is therefore calculated on an ex-ante basis as a maximum of 15,938 stoves per CPA.[14]

This then means that each stove in a typical CPA is responsible for 0.006% of the total potential savings:

GWh savings (per stove)	= *By Savings * NCVBiomass* = (2.71 * 4,167KWh) = 0.011GWh
CPA stoves	= GWh savings threshold/GWh savings per stove = 180/0.011 = 15,938
Stove savings % of threshold	= GWh savings per stove/GWh savings threshold = 0.011/180 = 0.006%

In compliance with EB68 Annex 27 para 2 (c), the proposed PoA, as described above, is solely composed of isolated units (stoves) installed in households. EB68 Annex 27 para 2 (c) indicates that: *the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.*

[13] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_VIIC5MTUUWR9PRPJL0EXOT3G2CKSFQ

[14] See emissions reductions calculation sheet (v3)

Therefore:

Stove savings % of threshold = GWh savings per stove/GWh savings threshold
= 0.011/3
= 0.4%

Each proposed CPA in the PoA is therefore automatically additional as it meets the 'positive list' criteria of EB68 Annex 27 para 2 (c) due to:

- each stove in a typical CPA represents only **0.006%** of the total potential savings, according to the methodology threshold for AMS. II.G (180GWh per annum)

- each stove in a typical CPA represents only **0.4%** of the unit threshold size noted in EB68 Annex 27 para 2 (c) (3GWh per annum)

In this regard, in all cases, the size of each unit is no larger than 5% of the small-scale CDM thresholds and each CPA meets the 'positive list' criteria of Annex 27 of EB 68. Each CPA is therefore automatically additional.

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

A.4.4.1. Operational and management plan:

3RL will have overall operational and management responsibility for the implementation and monitoring of the proposed PoA and is therefore acting as the sole PoA CME. 3RL will be responsible, in accordance with the Guidance in EB65 Annex 3, for the following operational and management activities related to each CPA included in the PoA:

1. *A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies*

Please see Annex 4, Section C for an organization chart. The roles and responsibilities are:

- *3RL Board & Zambia Branch Board*: oversight of management system & sign-off on CPA inclusions and monitoring reports, review of competencies of team members
- *Technical review team*: technical review of process and documentation; proposal of CPA-DDs and monitoring reports to 3RL board.
- *CDM Compliance Manager*: writing PDDs & monitoring reports, ensuring compliance with CDM rules
- *Zambia Directors*: oversee operation of distribution centres and head office; execution of set up activities; works with project manager on all planning; reports to 3RL Board.
- *Project Manager*: project planning and management; issue and risk management; execution of set up activities such as recruitment and training; reporting of monitoring data;
- *Logistics Manager*: planning; identification of target households; contractor management; overall day to day management of installation staff; weekly and monthly reporting.
- *Data administrators*: monitoring database management; accounting; data reconciliations; monthly reporting; local HR;
- *Pre- & Post-installation data collection*: conveying project messages; selling the project; signing up householders wanting a stove; sign up data capture; installation data capture

— *Installation team*: management of installation process; ensuring quality stove installations;
— *Monitoring team*: gathering compliance monitoring data; gathering marketing data; data input

Overall responsibility for the roles and responsibilities and associated below processes lies with the 3RL Board and 3RL will be the sole CME for every CPA included in the PoA. The 3RL Board assesses the competencies of individuals responsible for each of the roles stated above.

A. Manufacturing and logistics

Overall responsibility for manufacturing and logistics lies with the Zambian Directors and Project Manager. The process is as follows:

- Components for the stoves are manufactured (some imported into Zambia, others produced locally) by 3RL's project partners
- Components are distributed to warehouses within each CPA
- Regional logistics managers coordinate the distribution of components to recipient households for installation

B. CPA household identification

- A process for identifying households is managed by 3RL local logistics managers. This involves working with local community leaders and other partners to help identify recipient households suitable (i.e. those utilizing wood-fired, three rock fires) for the installation of a stove;
- In partnership with community leaders, NGOs and other local organizations, 3RL local logistics managers initiates a communication process to ensure that households understand the benefits of the stoves, that cultural issues are addressed and that users are trained in the optimal use and performance of the stove;
- 3RL pre-installation teams visit recipient households in each CPA and ensure recipients understand and sign the emissions rights acknowledgement; this will act as the "order" for each stove.
- Each stove is assigned a unique installation number chronologically; this is used to determine the CPA into which the stove is included

C. Installation

- Local 3RL logistics managers identify local installation partners and train stove installation teams to undertake installations within each CPA
- Local partners and installers coordinate the receipt of stove components in the distribution process
- Each installer will be trained in the installation of the stove to a standardized design and installation procedure
- Each installer will be responsible for physically installing the stoves in partnership with the stove recipient

D. Installation Data Capture

- A post-installation team checks the quality of installation work
- If the work is satisfactory, installation data is collected by the post-installation team, which includes:
    - A GPS location reference
    - The household family name and address/physical location (i.e. village) and/or Zambian government identification number of the stove recipient

- Date and time of installation
- Data is collected by the post-installation team electronically and uploaded automatically to the monitoring database
- The database will automatically generate a unique reference number for each stove

E. CPA Inclusion

CPA inclusions are the overall responsibility of the CDM Compliance Manager.

- Data from each CPA is provided by the Zambia Project Manager to the CDM Compliance Manager.
- The CDM Compliance Manager writes each CPA-DD
- The CDM Compliance Manager submits to the 3RL technical team for technical review
- The technical team proposes the CPA inclusion to the 3RL Board for approval

F. Monitoring

Monitoring activities will be conducted as follows:

- Surveys completed in the field by trained 3RL local monitoring teams
- Data captured by the monitoring teams is passed to 3RL data administration team
- Data is checked for completeness, consistency and accuracy
- Project manager summarizes data in a report to the 3RL CDM compliance manager
- CDM compliance manager writes monitoring reports for each monitoring period of the PoA
- Technical review by in-house technical team
- 3RL board sign-off
- Submission of issuance request to CDM Executive Board

2. Records of arrangements for training and capacity development for personnel

3RL conducts an ongoing programme of training and capacity development for key personnel. This training is premised on documentation that includes:

- Management Information Systems & Data Capture Process
- Stove Installation Guidelines

Records of training and capacity development will be kept by 3RL on each member of staff's file.

3. Procedures for technical review of inclusion of CPAs

The technical review of CPA inclusions will be undertaken at 3RL board level by an in-house technical team. This review will be undertaken in accordance with the eligibility criteria outlined in this PDD and the most recent guidance issued by the CDM Executive Board.

Following its review, the technical team will affirm the CPA's compliance with the eligibility criteria and recommend its inclusion in the PoA to the 3RL board. The proposed inclusion will then be either approved or rejected by the 3RL board.

4. 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 PoA)

Double-counting of emissions reductions will be avoided by the unique referencing of stoves included in each CPA. This will be done through:

- ***GPS references*:** each stove will have a unique GPS-referenced location. During the verification process the DOE will be able to check the existence of stoves related to this GPS location reference.
- ***Name, location and/or ID number*:** an additional check of double-counting may be made against the household name, location and/or Zambian government ID number of the stove recipient ascribed to each stove. This may be checked physically during the verification process.
- ***Unique reference numbers*:** each stove will also have a unique reference number in the monitoring database. Only one stove will be installed per household. The DOE will be able to check this during the verification process.

5. Records and documentation control process for each CPA under the PoA

3RL will act as the CME for every CPA included in the PoA and is responsible for managing the record and documentation system for each CPA under the PoA. In most cases data will be collected electronically and uploaded directly to the monitoring database. Where data is collected by hand, it will be collated by the 3RL Data Administration Team.

Installation data will be collected from each CPA by the post-installation team and uploaded into the PoA monitoring database. This will ensure that each stove is individually referenced and logged for monitoring and verification purposes.

Monitoring data will be collected by the monitoring team responsible and passed to 3RL administration for collation. Periodic monitoring reports and emissions reduction calculations will be generated from this data.

All records will be securely maintained and backed-up by 3RL.

6. Measures for continuous improvements of the PoA management system

Periodic reviews of the procedures noted here in this management system will be conducted at the behest of the 3RL board. This will be conducted at the time of each annual or biennial monitoring activity.

7. Any other relevant elements

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

Each CPA under the proposed PoA is exempt from a de-bundling check due to each independent subsystem/measure being less 1% of the small-scale methodology energy output threshold (as per guidance EB54 Annex 13).

The methodology threshold for AMS. II.G is 180GWh[15] per annum and each stove delivers 0.011GWh of thermal energy savings and therefore each CPA cannot exceed the threshold of 15,938 stoves. This then means that each stove in a typical CPA is responsible for 0.006% of the total potential savings[16]:

GWh savings (per stove) = *By Savings* * *NCVBiomass*
= (2.71 * 4,167KWh)
= 0.011GWh

CPA stoves = GWh savings threshold/GWh savings per stove
= 180/0.011
= 15,938

Stove savings % of threshold = GWh savings per stove/GWh savings threshold
= 0.011/180
= 0.006%

Each CPA is therefore exempt from a de-bundling check due to each or stove being less than 1% of the small-scale methodology energy output threshold and the stoves being installed in multiple locations.

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

3RL is the Managing Entity of the PoA and has overall responsibility for managing and operating each of the CPAs. Therefore, those operating the CPAs are legally contracted to 3RL and are fully aware of, and have agreed that, their activity is being subscribed to the PoA. Component manufacturers and installation team members will have specific contracts specifying this. There will also be an emissions rights acknowledgement between each stove recipient and 3RL that confirms the user's involvement in the PoA.

A.4.4.2. Monitoring plan:

The following monitoring activities will be completed by 3RL for the proposed PoA:

1) Selecting the Sample Groups

Sample group will be selected on a simple random sample basis from the monitoring database of installed stoves. This sample group will be selected with the required level of precision/accuracy, according to the methodology and the EB69 Annex 4: STANDARD FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES. The detailed sampling plan according to the guidance is outlined below in section E.7.2.

The individual participants in the survey will be selected by a random selection programme run on the PoA monitoring database. The sampling frame will consist of installed stoves and the sample will be generated from this population. This simple random sample will generate the participants in the sample groups. The sample groups will be re-selected each time to ensure the selection remains random.

[15] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_VIIC5MTUUWR9PRPJL0EXOT3G2CKSFQ

[16] See Emissions Reductions Calculation Sheet (v3)

A simple random sample may also be used by the DOE for verification of emissions reductions achieved by the PoA. In this way the DOE may verify emissions reductions across the PoA by sampling the PoA's monitoring database, only selecting a unique verification sample group.

2) Activity monitoring

The activity sample group (ASG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4: STANDARD FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES.

Monitoring teams will survey the usage of 3-rock fires for domestic cooking and water heating purposes only. 3-rock fires used for communal purposes (beer brewing, socializing etc.) will be excluded from the survey, as these were excluded from the baseline woodfuel surveys.

The following monitoring activities of the ASG will be undertaken:

- Monitoring staff shall complete an observational check to see that the stove is still located in the same place identified by the installation data and observe that it is still being used
- Monitoring staff shall ask users to confirm that the stove is being used for the recipient household's domestic purposes
- Monitoring staff shall confirm that the old appliance (3-rock fire) has been effectively disposed of, and, if not;
- Monitoring staff shall ascertain residual usage of the domestic 3-rock fire. If this usage includes cooking, water heating or space heating (i.e. those usages measured in the baseline survey), then the average annual wood fuel used for these purposes shall be calculated as a proportion of overall average annual wood fuel usage. This proportion will form any percentage deduction from B_{old} and will be applied to emissions calculations in each monitoring report.

These activities will be undertaken by 3RL monitoring teams annually or biennially and data/responses will be collected electronically and then submitted to 3RL administration.

3) Stove efficiency monitoring

Annually or biennially, a sample of installed stoves will be selected on a simple random sample basis to test the ongoing efficiency of the stoves, utilizing the stove manufacturers' EPTP which was used in the baseline efficiency test.

This stove efficiency sample group (SESG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 Guidance: STANDARD FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES.

4) Data Management

Monitoring data from the field surveys will be collated and checked by 3RL administration. Installation data in the monitoring database will be used to identify the households in the ASG and SESG. Responses from the monitoring surveys will be retained by 3RL for verification by the DOE.

Monitoring data will be analysed and summarized in the applicable monitoring reports.

5) Monitoring report

A monitoring report will be written at the end of every monitoring period and submitted to the DOE responsible for verification. This report will indicate how the monitoring plan has been followed and calculate each CPA's emissions reductions for each monitoring period.

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

There will be no public funding involved in the proposed PoA.

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

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

The starting date of the proposed PoA is 22/12/2010, which is the date of commencement of 'real action' in the PoA. This date has been selected as it is the date when the first stoves were ordered under the PoA. It is not earlier than the commencement of validation of the programme of activities, i.e. the date on which the PoA-DD is first published for global stakeholder consultation, which was 24/11/2010.

Individual CPAs may have a starting date prior to the registration of the PoA and this shall not be earlier than the commencement of validation of the programme of activities.

The starting date of the crediting period of each CPA shall not be earlier than the date of its inclusion in the registered PoA.

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

The length of the PoA is initially limited to a 7 year crediting period. This may be renewed up to 3 times.

This length has been selected for the PoA as it is consistent with the minimum projected operating lifetime of the stove, as indicated by the stove designer and manufacturer. The actual lifetime may be considerably longer, allowing for the PoA to be potentially extended beyond 7 years.

SECTION C. Environmental Analysis

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

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

The environmental analysis was chosen to be undertaken at PoA level because there is no variation in the stove technology and the installation procedure amongst CPAs. Furthermore, CPAs are defined by numbers of stoves and not geographically, making a CPA-level environmental analysis difficult.

The PoA does not incur any negative environmental impacts and it is therefore reasonable to consider a single environmental analysis at the PoA level, rather than individual assessments for each CPA.

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

No negative environmental impacts have been identified from the proposed PoA and this has been confirmed by the Environmental Council of Zambia (See Annex 3: letter dated 16/03/2011).

3RL has identified a number of positive environmental impacts related to the implementation of the PoA, although these will not be specifically monitored over the lifetime of the PoA:

- Reduced air pollution related to the reduced, and more efficient, combustion of biomass
- Biodiversity protection, due to the reduction in deforestation rates and the subsequent protection of forest habitat[17]
- Maintenance of watersheds that regulate water table levels and prevent flash flooding, through reduced deforestation[18]

3RL has not identified any localized trans-boundary environmental impacts related to the proposed PoA. Despite significant deforestation, the supply of domestic woodfuel is provided for locally by the existence of sufficient biomass within Zambia, as identified in the baseline data.

Globally, the clear impact from the PoA is a reduction in greenhouse gases mitigating the risk of climate change, as evidenced in the emissions reductions calculations in each monitoring period.

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

In accordance with Zambian regulations, an EIA is not required for typical CPAs included in the proposed PoA. This has been confirmed by the Environmental Council of Zambia, indicating that the project has positive impacts on the environment. (See Annex 3: letter dated 16/03/2011)

SECTION D. Stakeholders' comments

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

[17] http://www.illegal-logging.info/approach.php?a_id=54

[18] http://www.meted.ucar.edu/hazwarnsys/ffewsrg/FF_EWS.Chap.2.pdf

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

Note: If local stakeholder comments are invited at the PoA level, include information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received, as applicable.

Stakeholder comments were invited at the PoA level to assess the appropriateness and acceptability of the proposed PoA design. The boundary of the PoA is Zambia and, as CPAs are not defined geographically (only numerically, by total numbers of stoves), it was important to consult stakeholders at the PoA level to ensure that the consultations were inclusive.

3RL has undertaken the following activities to invite stakeholder comments:

Sept-Oct 2010	Regional stakeholder meetings and stove user trials in Nyimba District
March 2011	Regional stakeholder meetings and stove user trials in Katete District
March 2011	National level stakeholder meetings and feedback: • GRZ Ministry of Community Development and Social Services • GRZ Department of Energy • Council of Churches • Islamic Council of Zambia • Zambian Civil Society Climate Change Network • Green Enviro-Watch • House of Chiefs

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

Stakeholders were invited to participate in consultations for the implementation of the PoA. These consultations were undertaken as meetings at various stages in the PoA's development. Each meeting was set-up using the following process:

1. Invitations
   Where appropriate, and dependent on local conditions, stakeholders were invited in one of the following ways:
   a. Public Invitation: a newspaper notice and/or radio announcement, placed in local media prior to the stakeholder meeting
   b. Public Notices: fliers placed at strategic locations inviting participants
   c. Personal Invitation: individuals were identified and invited personally with a written or verbal invitation.

   A 'tracking list' of invitations will be established for meetings to ensure that invitations are monitored and logged for responses.

2. Meeting Preparation
   The following must be in place prior to the actual meeting:
   a. Non-technical summary: a simple description of the project that stakeholders will understand
   b. Minute taker: an individual responsible for taking detailed notes of the meeting findings
   c. Participation forms: participants must sign this form to confirm their attendance

d. Evaluation forms: a simple evaluation form asks each participant to write down their feelings and concerns raised in the meeting and the proposed PoA
e. Agenda for the meeting
f. Translator (where required)

3. Meeting conduct
   The meeting will largely follow an agenda according to a common approach:
   a. Opening: introductions, goal of meeting, participation/evaluation form
   b. Explanation of PoA: overview of goals, understanding CDM process, who is involved, project phases and timelines, monitoring requirements, emissions rights acknowledgement
   c. Explanation of stove: the technology, how it is installed and used, the benefits
   d. Questions & Answers: for clarification of key points
   e. Closure: complete evaluation forms and thanks

D.3. Summary of the comments received:

1. Comments from Nyimba meeting and user trials:

First stove recipient: explained that there are major advantages to using the efficient stove installed for her; she found that she only used three pieces of wood to cook within two days whereas previously this would have been used a lot more quickly. She also said there has been much less smoke and less mess due to containment of the ash.

The local councillor for Chiweza ward: has seen a big difference in the amount of wood that people are using and that when he had collected feedback himself it was all positive. He noted that the users don't need to chop down trees because sufficient fuel could be gathered into a basket. Another comment was that there was so little smoke that the family could eat together very soon after the cooking had finished; previously the amount of smoke would mean that it was some time until the room was habitable again after cooking. He stated that his family had more time together as a result. He went on to say that there was visibly less soot in the room, which meant that the roof was likely to remain stronger for longer in his house[19].

Second stove recipient: she had used big pots and that she found it much better than her previous methods, adding that she thought that the cooking area was bigger than the one she had before.

Third stove recipient: made clear the safety aspect that she had noticed, with her three stone fire, there were regular accidents, of people tripping over protruding branches, spilling the water or standing on ash. With her efficient stove this was all solved.

Fourth stove recipient: was keen to mention the workload and the difference that it made to the quality of life for women. Previously she would be dragging a log, carrying a child and some tools to rush back to cook; now the small amount of wood required was making life much easier with less gathering time required.

Fifth stove recipient: mentioned that she could use the same piece of wood to cook the whole meal due to the efficiency of her stove. One impact that had not been mentioned was the fact that everything was

[19] Soot can accumulate in the thatch roof, weakening it and also causing soot to fall on people anytime a rodent/insect comes through the roof. The roof needs more regular replacement as a result.

cleaner and easier, including the washing of the pots, which looked like they had been using electricity and were very clean). Previously she would have to scrub using sand to clean them.

Sixth stove recipient: explained that he was particularly pleased with the safety advantages that this stove brings with no tripping hazards or issues with falling into the hot ash.

The following comments were received from the written feedback forms at the community meeting:

- I like it because there's reduction of labour to the women, also prevent from coughing. (Don't like) because it is one stove. *Agnes Daka*
- I think the meeting has been of great importance to us participants. I have liked the project because it reduces the cutting of trees, anyhow, and reduces the risk of women getting sick. *Joseph Beulani, Nyimba Central Orphans Project*
- All I can appeal is that if possible if you can make other stoves, women can have two plates so that when cooking nshima you can cook relish as well. *Gertrude Phiri, Mpeta village*
- It is my first time to hear about it but is very profitable to many lives. The project has come at a right time. *Selina Mumba, Nyimba Congregation, R.C.Z.*
- It's a very good meeting with the meaningful to people who use firewood to cook. I like this project because the cookstove which you have introduced to us is simple to use, and uses little firewood. (Don't like) Because once installed the cookstove you can't remove it. *Benson Zimba, Nyimba District Business Association*
- I like this project because we have been given some modern fire stoves which I didn't have before. What I wouldn't like is if promises are not fulfilled, it will bring a lot of problems to the communities. *Joseph Phiti, Area Councillor, Chiweza Ward*
- I have received it positively and very willing to make use of it with maximum care. It reduces the amount of firewood and natural resources like trees will be conserved, less smoke is produced, less labour is required. It is also free or not costly. (Don't like) the idea of having repairer or people working on them coming overseas. *Captain Clayford Nsana, Secretary, Salvation Army*
- It reduces labour in terms of firewood cutting, improves human health and reduces deforestation. (It is unfortunate) that the stove can only save on household basis and not big institutions like hospitals, schools, churches, community based groups etc. We are lucky because the stove is free of charge. *Evangelist William Daka, Youth Patron, Anglican Church, Nyimba*
- The project will mostly address and reduce labour especially for women, as they tend to spend more time preparing meals for their families. As the stove manufacturers are not locally based but outside, it would be good to train local people to maintain the stoves. *Diana Kawanda Musaka, Ministry of Community Development and Social Services, Nyimba*
- It does not cater to the industries which are major causes of climate change, water and air pollution which are a major threat to human health. These stoves should only be given in rural areas where there is high use of charcoal and wood fuel because people in urban areas have cookstoves using connected power (national grid) and they can afford to pay the bills. *Rafael Monzita, SCORE Zambia*

2. Comments from Katete meeting and user trials:

3RL explained the project to the District Commissioner, District Agricultural Officer and two Katete regional Chiefs. 3RL were was received and invited by the Chiefs to return to install stoves. All four leaders expressed initial support and indicated that the impact of the stoves – reduced pressure on forests, and time and labour savings for women – would be very positive for Katete households.

The community meeting raised a number of comments:

Question / Comment	Response from 3RL
Will people in town benefit?	People in town typically use charcoal. Rural villagers use wood for energy and therefore will be the project focus.
Will people need to supply cement and bricks?	3RL will supply cement and we will ask villagers to supply approximately 25 bricks per stove.
Will the stove heat like a brazier?	The stove is much more energy efficient and therefore keeps heat inside.
What is the lifespan? What happens after that?	If looked after the stove should last 7 years. 3RL intends to maintain a presence in the district through this time and we will make a decision at that point regarding whether to bring new stoves.
Can other organizations help to sensitize people about the project?	Yes, we would like you to get involved.
How can the smoke that is emitted be managed?	The stove will emit less smoke than the traditional fire and as such it can be placed anywhere in the household.
Can the stove be moved if a farmer moves household?	The stove should not be moved. People should contact us if they wish to move households and we'll look into the possibility of constructing a stove in the new home.
Why does the stove need to be built in?	It must be in a fixed location so we can keep track of it. Also, it looks nicer and its durability and security is improved if it is built in.
Well done for supplying the cement which is very expensive for rural people. As it is only 25 bricks people can supply these. (comment from DC)	Thank you
Are the stoves of uniform size?	Yes, we will build each stove to a standard. Each will be made from approximately 25 bricks. However, a user can add to the structure at a later stage.
The demand will be greater than 32000 stoves and people in other areas (Chipata and Petauke) will be interested. How will you manage this demand?	We are focused on Katete to begin with and will assess the project success at end 2011. At that time we will make a decision re where to go next.
Can the stoves be used for institutional use?	This is not the focus of our project.

3. Comments from national stakeholder meetings:

Ministry of Community Development and Social Services
Contact: Ms. Sherry Thole, Permanent Secretary
Date: 21/03/2011

The PS responded positively to the idea of the project and displayed a familiarity with carbon markets. She suggested that 3 Rocks might benefit from coordinating a stove marketing session with a joint Ministry-UNDP event in Eastern Province.

Green Enviro-Watch
Contact: Mr. Abel Musumali, Chief Executive Officer
Date: 22/03/2011

This NGO is focused on addressing youth and employment-related issues in the context of climate change and low-carbon development. They are represented in 70 districts across Zambia, with 350 individual members, 36 member organizations and various connections to regional and international organizations. They have eight full-time staff and are donor-funded.

Questions and feedback which included:

- Who makes the stove? It would have been better for 3 Rocks to manufacture the stoves locally so as to allow Zambia to full benefit from a transfer of technology. Zambians should be involved to some extent in maintenance.
- The environmental and social benefits are clear and very positive.
- Giving stoves away for free is not an ideal approach.
- We will likely come across challenges getting people to switch to the stoves.
- It would be good to offer bigger stoves for cooking in larger pots for larger numbers of people.
- Long term ongoing sensitization and follow up will be necessary.

The two officers agreed enthusiastically that they would like to hear periodically from 3RL regarding the progress of the project, and would be available for support and guidance on community engagement or other challenges we might come up against.

Zambia Civil Society Climate Change Network
Contact: Mr. Machaya Chomba, WWF and ZCCCCN
Date: 24/03/2011

Specific questions and/or feedback included:

- What form the community trust will take and whether it would be possible for communities to buy into the project as 3 Rocks shareholders
- The communities must see the impact over time on their forests and some work by other organizations in the areas surrounding the project would be valuable in establishing environmental, health or social baselines and monitoring the impact of the project.
- It may be a problem for households to all supply bricks – we might consider using clay to install instead.
- 3RL should keep in mind the overall environmental impact of the project.

House of Chiefs
Contact: Chief Madzimawe, Chair of the House of Chiefs of Zambia
Date: 25/03/2011

The Chief said that he had just the day before been briefed by Zambia's Ambassador to the United Nations on issues that had come up during the UN General Assembly, including climate change. The Chief spoke for several minutes about his concerns on climate change and indicated that he was receptive to hearing more about the project.

The Chief's questions and feedback included:

- Deforestation is a major issue – both for firewood and charcoal. What will our children use for cooking?

- He doesn't think anyone will be against the concept of the project as it will reduce the pace of tree-cutting and will have a positive impact on the health of our mothers.
- 3RL has his full support.
- 3RL can feel free to come back to him for guidance or specific assistance on communicating messages about switching to stove us and on distribution.
- It was very good for us to have started with engaging the Chiefs and traditional leaders – they will be our ambassadors. He will inform the Chiefs at their April-May 2011 seating (full meeting in Lusaka) and would like to invite us to come present the project to that audience.

Department of Energy
Contact: Mr. Oscar Kalumiana, Director
Date: 25/03/2011

Questions and feedback included:

- What will the benefits be to local economies?
- The Zambia Gender and Energy Network (ZGEN) might be a good organization to partner with
- CDM should clearly benefit local communities
- Technology transfer should be a key consideration for the project.
- 3RL should look at charging for the stoves, possibly on a monthly instalment plan such as has been used by the Lusaka Sustainable Energy CDM project.
- Energy efficient stoves are a very good idea; the Ministry itself had done some distribution of 200 gel-fuel stoves in Chipata and is very interested in how this project pans out. They'd like to see it succeed and would be interested in periodic updates going forward.
- There is an Energy Week in June 2011 and they would like 3 Rocks to demonstrate the stove. They would also be interested in sending members of their team to any launch events in Katete and might also like to join to observe some of the early installations.
- The concept is very good and the cast iron top will ensure the stove lasts a long time unlike the mud stoves the DoE has been promoting. The project will lessen burdens for women and children and will protect the environment.
- As long as people in Katete are convinced it appears to be a sustainable project.
- There may be political tension regarding distribution and 3RL must involve local chiefs and headmen in order to overcome this.
- All questions during this meeting have been adequately dealt with. It is good that 3 Rocks is being transparent from the outset.
- Sustainability may be an issue after the project moves out of an area – local communities tend to abandon project activities once it's no longer running. Change usually meets resistance as well. Need to leave in place a mechanism for follow-up by local leaders.
- We're happy to have another CDM project in the country.

Council of Churches in Zambia
Contact: Reverend Suzanne Matale
Date: 27/03/2011

The Council of Churches had a very positive response to 3RL's presentation of project plans. While they've traditionally focused on issues of social and economic justice, they have more recently begun to look at climate justice and it is now a core issue on which they are trying to be proactive. Questions and feedback included:

- It's good for households to provide bricks and sand but this isn't a long term sustainable approach.
- Are the stoves secure?
- What about employment and training?
- Will the information be translated? [Yes]
- It's been a challenge for the Church to bring climate change information to the village level. That this project will have the added benefit of informing thousands of people about climate issues is very good.
- It is good not to attempt to introduce a completely new technology – the stove seems to be a natural carry-on or "scaling up" of the 3 stone fire and will have better chance of acceptance.
- The Council of Churches can offer assistance in mobilization of human resources, and would be happy to provide a letter of support or of introduction.
- The project sells itself.
- There is a Climate Justice Network church conference to be hosted in Zambia this year and they would like 3RL to present the project there.

Zambia Islamic Community Services Trust
Contact: Mr. Ibrahim Yusuf, Spokesman
Date: 29/03/2011

The ZICST is the official community outreach arm of the Lusaka Muslim Society. It deals with community projects and charity work for vulnerable communities of any religion. It is the arm of the Muslim Society that engages with government.

The project and stove were presented, with questions and feedback included:

- This is a fantastic idea. They have always toyed with the possibility of distributing stoves but have never followed through.
- Mr. Yusuf is from Chipata (provincial capital near Katete) and grew up in the village and believes that the people there will be very happy with these stoves.
- It is good that the project will also be educating people about environmental issues like deforestation.
- The built-in design is better than a free-standing stove.
- Mr. Yusuf would be happy to facilitate contact with Muslim leaders in Katete and throughout Eastern Province, where there is a large population of Muslims.

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

Comments were responded to in the following ways:

- Installation of stove conducted by non-local people

It was explained that the installation of the stoves will be conducted by local Zambian supervisors in partnership with the recipients. In this way, the project will help to contribute to a local market economy and foster a sense of ownership of the stove for recipients.

- Stove design – non-movable and not robust enough; secure?

3RL explained that the stove is secured to ensure that there is no theft or damage incurred during its lifetime. It was explained that if a recipient moves home, they should inform 3RL to ensure that the

ownership of the stove transfers to the new homeowner and allow 3RL to investigate the possibility of the original household recipient participating in the project at their new location. 3RL repeated that once stoves are built in to the brick and cement structure they would be secure from all but the most dedicated attempts to steal or damage them.

- Only one stove

It was explained that the stove is expected to replace the existing cooking appliance (i.e. a 3-rock fire) and that it should be used for all primary cooking and water heating needs. As the stove is more efficient than the existing fire, it was explained that it is able to be used for more purposes. It is not possible to distribute more than one stove per household.

- Only for households – not institutions or businesses

In the explanation of the project, it was made clear that the stove is only for household use. It was explained that there is the possibility of conducting this type of project in institutions and businesses, but that this would have to be considered separately.

- Education and training

3RL outlined in more depth employment and training plans for the PoA, including estimates of job creation. 3RL plans to conduct an ongoing awareness campaign to ensure the successful uptake and correct use of the stove.

- Economic benefits

3RL noted that there are direct and indirect economic benefits – a direct reduction of costs, if any, associated with buying wood; and indirect benefits of increased free time, improved health and a long term reduction of pressure on the surrounding environment.

SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate how the baseline and monitoring methodology is applied in each CPA. The information defines the PoA-specific elements that shall be included in preparing the PoA specific form used to define and include a CPA in this PoA (PoA specific CPA-DD).

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

Each CPA in the proposed PoA will apply the approved small-scale baseline and monitoring methodology II.G. *Energy efficiency measures in thermal applications of non-renewable biomass; Version 3*

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

1. This category comprises appliances involving the efficiency improvements in the thermal applications of non-renewable biomass. Examples of these technologies and measures include the introduction of high efficiency biomass fired cook stoves or ovens or dryers and/or improvement of energy efficiency of existing biomass fired cook stoves or ovens or dryers.

This methodology has been selected as the technologies and measures to be implemented in the proposed PoA include the introduction of high efficiency biomass-fired cooking stoves, as described in section

A.4.2.1 above. The introduction of the efficient stoves is the stated goal of each CPA under the proposed PoA.

2. Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

The harvesting of non-renewable biomass is commonplace in Zambia and can be reasonably concluded that has been the case since 31 December 1989.

Between 1990 and 2000, Zambia lost, on average, 444,800 hectares of forest per year. This amounts to an average annual deforestation rate of 0.91%. Between 2000 and 2005, the rate of forest change increased by 10.0% to 1.00% per annum. In total, between 1990 and 2005, Zambia lost 13.6% of its forest cover, or around 6,672,000 hectares. Measuring the total rate of habitat conversion (defined as change in forest area plus change in woodland area minus net plantation expansion) for the 1990-2005 interval, Zambia lost 14.3% of its forest and woodland habitat.[20]

Furthermore, the Food and Agriculture Organization of the United Nations' Global Forest Resources Assessment (FRA) Country Report of Zambia indicates that forested and other wooded land has been steadily decreasing since 1990[21]:

	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]
Zambia	52800	51134	50301	49468	-167	-0.32	-167	-0.33	-167	-0.33

The country-specific default value for f_{NRB} shows that non-renewable biomass currently accounts for 81% of the total biomass harvested in Zambia. It is therefore concluded that non-renewable biomass has been in use since 31 December 1989.

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

The project boundary is described in the methodology as: *the physical, geographical site of the efficient systems using biomass*. Under the proposed PoA, each CPA is within the country of Zambia and the physical, geographical site of each stove will be within a single household in Zambia which will be identified by a specific unique GPS referenced location.

Emissions sources to be included in, or excluded from, each SSC-CPA boundary in the proposed PoA:

	Source	Gas	Included?	Justification / Explanation
Baseline	Combustion of fire wood for cooking (3-Rock fire)	CO_2	Yes	Major source of emissions
	Combustion of fire wood for cooking (3-Rock fire)	CH_4	No	Minor source of emissions and limited data available. Exclusion is conservative assumption.
	Combustion of fire wood	N_2O	No	Minor source of emissions and

[20] All data in this paragraph from: http://rainforests.mongabay.com/deforestation/2000/Zambia.htm

[21] Global Forests Resources Assessment 2010, FAO (http://www.fao.org/forestry/fra/fra2010/en/)

	for cooking (3-Rock fire)			limited data available. Exclusion is conservative assumption.
Project activity	Combustion of fire wood for cooking (efficient stove)	CO_2	Yes	Major source of emissions
	Combustion of fire wood for cooking (efficient stove)	CH_4	No	Minor source of emissions and limited data available. Exclusion is conservative assumption.
	Combustion of fire wood for cooking (efficient stove)	N_2O	No	Minor source of emissions and limited data available. Exclusion is conservative assumption.

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

The baseline scenario, as identified above, is the continued use of non-renewable biomass as fuel on wood-fired, 3-rock fires for cooking purposes in Zambia.

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

Each proposed CPA will reduce GHG emissions through the installation of fuel efficient stoves that reduce the total quantity of non-renewable biomass used by each recipient household for domestic purposes. Each CPA is additional as it relies solely on carbon finance to ensure its implementation. There are no other sources of revenue from the PoA other than from the sales of issued Certified Emissions Reductions (CERs). There is no other incentive to undertake each CPA, nor is there any regulation in Zambia mandating this activity.

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

The assessment of the PoA's additionality is addressed in accordance with applying paragraph 2 (c) of Annex 27 of EB 68: GUIDELINES ON THE DEMONSTRATION OF ADDITIONALITY OF SMALL-SCALE PROJECT ACTIVITIES:

> Documentation of barriers, as per paragraph 1 above, is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:
>
> *Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds*
>
> *1 That is the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.*

Projects applying the small-scale methodology AMS IIG v3 have a threshold of 180GWh maximum thermal energy savings per annum.[22] As stated in the eligibility criteria, each CPA will not exceed this

[22] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_VIIC5MTUUWR9PRPJL0EXOT3G2CKSFQ

threshold. The GWh savings per stove per year in the proposed project is 0.011 and this is therefore calculated on an ex-ante basis as a maximum of 15,938 stoves per CPA.[23]

This then means that each stove in a typical CPA is responsible for 0.006% of the total potential savings:

GWh savings (per stove)	= *By Savings * NCVBiomass* = (2.71 * 4,167KWh) = 0.011GWh
CPA stoves	= GWh savings threshold/GWh savings per stove = 180/0.011 = 15,938
Stove savings % of threshold	= GWh savings per stove/GWh savings threshold = 0.011/180 = 0.006%

In compliance with EB68 Annex 27 para 2 (c), the proposed PoA, as described above, is solely composed of isolated units (stoves) installed in households. EB68 Annex 27 para 2 (c) indicates that: *the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.*

Therefore:

Stove savings % of threshold	= GWh savings per stove/GWh threshold = 0.011/3 = 0.4%

Each proposed CPA in the PoA is therefore automatically additional as it meets the 'positive list' criteria of EB68 Annex 27 para 2 (c) due to:

- each stove in a typical CPA represents only **0.006%** of the total potential savings, according to the methodology threshold for AMS. II.G (180GWh per annum)

- each stove in a typical CPA represents only **0.4%** of the unit threshold size noted in EB68 Annex 27 para 2 (c) (3GWh per annum)

In this regard, in all cases, the size of each unit is no larger than 5% of the small-scale CDM thresholds and each CPA meets the 'positive list' criteria of Annex 27 of EB 68. Each CPA is therefore automatically additional.

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

Additionality is demonstrated automatically in each CPA by ensuring the PoA technology meets the positive list definition in EB 68 Annex 27:

[23] See emissions reductions calculation sheet (v3)

Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds

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

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

Each CPA will involve the introduction of high efficiency biomass fired cook stoves and therefore will reduce the total amount of non-renewable biomass used by recipients for cooking purposes annually. Emissions reductions will be calculated as per the formulas provided in the baseline and monitoring methodology: AMS II.G. *Energy efficiency measures in thermal applications of non-renewable biomass; Version 3.*

ERy is calculated using the following formula:

$ER_y = By,_{savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$

Where:

$B_{y,\ savings}$ is estimated using option 2 in the methodology:

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

Where:

B_{old} = Quantity of woody biomass used in the absence of the project activity in tonnes; determined using Option (a):

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,

η_{old} = A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used

η_{new} = Efficiency of the system being deployed as part of the project activity (fraction), as determined using the stove manufacturer's Emissions & Performance Test Protocol (EPTP)[24] , which

[24] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

includes the WBT[25]. Use weighted average values if more than one type of system is being introduced by the project activity

Ly Leakage will be accounted for by applying the methodology gross adjustment factor (0.95) to emissions reduction calculations.

Monitoring will be conducted annually or biennially.

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

Emission reductions per stove will be published in periodic monitoring reports, incorporating all CPAs included in the PoA, and calculated according to the following methodological formula:

Ex-Ante emissions reductions are calculated as follows:

$ER_y = By,_{savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$

Where:

1. $B_{y,\ savings}$ Quantity of woody biomass that is saved per stove per annum in tonnes. The formula for calculating this is: $B_{old} * (1 - \eta_{old} / \eta_{new})$ (calculated on an ex-ante basis at 2.71 tonnes per household per annum)
2. $f_{NRB,y}$ The fraction of biomass used in absence of the project that is non-renewable (0.81).
3. $NCV_{biomass}$ Methodology default (0.015 TJ/tonne)
4. $EF_{projected\_fossilfuel}$ Methodology default (*81.6 tCO2/TJ)*
5. B_{old} Quantity of woody biomass used in the absence of the project activity in tonnes (4.1 tonnes per household per annum baseline survey, see Annex 3 * 15,938[26] = 65,345t)[27]
6. η_{old} Methodology default (0.10)
7. η_{new} Thermal efficiency of the new appliance (0.295 baseline EPTP test, see Annex 3).
8. *Ly* Methodology default (0.95)

Ex-post emissions reductions are calculated as follows:

[25] The Stove Manufacturers Emissions & Performance Test Protocol (EPTP) updates the Water Boiling Test (WBT) protocol version 3.0 by Balis et. al. and provides a standardized protocol for measuring and comparing cook stove performance. The EPTP is an approximation of real world cooking processes, which can be conducted on most stoves throughout the world. By using measured thermal efficiencies and emissions productions, the WBT can be used to roughly predict the performance of stoves for various cooking tasks.

[26] Calculated on a per CPA basis: See Emissions Reductions Calculation Sheet (v3)

[27] Methodology Option A selected: Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage.

$ER_y = (By,_{savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel})$

Where:

1. $B_{y,\ savings}$ Quantity of woody biomass that is saved per stove per annum in tonnes. The formula for calculating this is: $B_{new} * (1-\eta_{old}/\eta_{new,i})$
2. $f_{NRB,y}$ Fraction of biomass used in absence of the project that is non-renewable. Country-specific default value selected (0.81).
3. $NCVbiomass$ Methodology default (0.015 TJ/tonne)
4. $EF_{projected\_fossilfuel}$ Methodology default (81.6 tCO2/TJ)
5. B_{new} Monitored average quantity of woody biomass saved per stove per annum
6. Ly Methodology default (0.95)
7. η_{old} Methodology default (0.10)
8. $\eta_{new,i}$ Monitored thermal efficiency of the new appliance

ER_y will then be divided by 365 to give emissions reductions per stove per diem and this figure will be multiplied by the total aggregated number of stove operating days per monitoring period (*OD*) to give the total emissions reductions per monitoring period.

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

Data / Parameter:	B_{old}
Data unit:	Tonnes per annum
Description:	Quantity of biomass used in absence of the project activity
Source of data used:	Baseline survey
Value applied:	(4.1*15,938) = 65,345
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline survey assessed the average domestic biomass usage for cooking and water heating per household per annum amongst users of traditional 3-rock fires, according to interviews. This data was gathered according to: General Guidelines For Sampling And Surveys For Small-Scale CDM Project Activities (Version 01); CDM EB50 Annex 30. This figure is then multiplied by 15,938, which is the total number of stoves allowable to be included in each CPA, according to the methodology threshold[28].
Any comment:	See Annex 3 & Sampling Plan for Household Annual Average Woodfuel Usage Survey for details.

Data / Parameter:	η_{new}
Data unit:	Fraction
Description:	Thermal efficiency of the stove
Source of data used:	Stove Manufacturers Emissions & Performance Test Protocol (EPTP) Certificate
Value applied:	0.295

[28] For details see Emissions Reductions Calculation Sheet

Justification of the choice of data or description of measurement methods and procedures actually applied :	The stove design was tested independently for its efficiency.
Any comment:	See Annex 3

Data / Parameter:	$f_{NRB,y}$
Data unit:	Fraction
Description:	Non-renewable biomass usage in Zambia, as a proportion of total biomass usage
Source of data used:	EB 67 country-specific default value for Zambia
Value applied:	0.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	An independent consultant calculated the overall biomass usage in Zambia and, according to independently published sources, ascertained the proportion of that biomass which is non-renewable to be 0.93. However, EB 67, Annex 22 indicates a country-specific default value for Zambia at 0.81. For conservativeness, the latter value is selected.
Any comment:	See Annex 3 for original baseline *fNRB* assessment

Data / Parameter:	η_{old}
Data unit:	Fraction
Description:	Efficiency of 3-rock fire cooking method (system being replaced)
Source of data used:	Methodology default
Value applied:	0.10
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS II.G, version 3
Any comment:	

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/tonne
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data used:	IPCC default
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS II.G, version 3
Any comment:	

Data / Parameter:	$EF_{projected\_fossilfuel}$

Data unit:	tCO_2/TJ
Description:	Emission factor: substitution of non-renewable biomass by similar consumers
Source of data used:	Methodology default
Value applied:	81.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS II.G, version 3
Any comment:	

Data / Parameter:	*Ly*
Data unit:	Fraction
Description:	Leakage
Source of data used:	Methodology default
Value applied:	0.95
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS II.G, version 3
Any comment:	

Data / Parameter:	*DRB*
Data unit:	Tonnes
Description:	Demonstrably renewable biomass
Source of data used:	$f_{NRB,y}$ baseline study
Value applied:	1,278,025
Justification of the choice of data or description of measurement methods and procedures actually applied :	The justification is clearly outlined in the full $f_{NRB,y}$ baseline study, presented in Annex 3.
Any comment:	See Annex 3 for original baseline *fNRB* assessment

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

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

Data / Parameter:	*NS*
Data unit:	Number
Description:	Number of stoves still operation during the monitoring period
Source of data to be used:	Installation data and monitoring survey
Value of data applied	n/a; will only be available ex-post

for the purpose of calculating expected emission reductions	
Description of measurement methods and procedures to be applied:	Annually or biennially, a simple random sample of installed stoves will be selected from the monitoring database to determine if they are still operating or are replaced by an equivalent in service appliance. The activity sample group (ASG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 & 5 Guidance. The total number of stoves in operation compared to the total number of stoves installed (according to the installation records in the monitoring database) will be surveyed. Stoves in operation in the Activity Sample Group (ASG) will be counted during each monitoring period to derive an attrition rate (expressed as a percentage) and this percentage deduction will be applied to the total number of stoves operating.
QA/QC procedures to be applied:	The unique reference number of each stove shall be logged in the monitoring database showing the total number of stoves. Data from the ASG will be collected either annually or biennially and applied to the emissions reductions calculations during that period. In case of any variation between the installation data and the ASG monitoring data, a larger sample may be selected to ensure greater accuracy. During the first annual or biennial period, the initially installed number of stoves, as indicated by the monitoring database, will apply for interim monitoring reports.
Any comment:	

Data / Parameter:	*OD*
Data unit:	Days
Description:	Total stove operating days in monitoring period
Source of data to be used:	Installation and monitoring survey data in monitoring database
Value of data applied for the purpose of calculating expected emission reductions	n/a; will only be available ex-post
Description of measurement methods and procedures to be applied:	The number will be calculated by counting the number of days from the installation date of each stove until the end of the monitoring period and aggregating the total days. This number will be calculated net of any stove attrition rate identified in the ASG survey.
QA/QC procedures to be applied:	The unique reference number of each stove shall be logged in the monitoring database. The date of installation shall be utilized to determine the portion of the monitoring period that the stove has been in operation. Any interruption in the stoves' operation (e.g. where stoves are replaced or drop out) will register as missed operating days in the monitoring database for emissions calculation purposes.
Any comment:	

Data / Parameter:	$\eta_{new,i}$

Data unit:	Fraction
Description:	Thermal efficiency of the stove
Source of data to be used:	Stove manufacturers' Emissions & Performance Test Protocol (EPTP) test
Value of data applied for the purpose of calculating expected emission reductions	n/a; will only be available ex-post
Description of measurement methods and procedures to be applied:	Annually or biennially, a sample of stoves will be tested for their thermal efficiency to ensure that they are still operating at the specified efficiency. The total number of stoves to be selected for efficiency monitoring will be a simple random sample of installed stoves which are in operation. The stove efficiency sample group (SESG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 & 5 Guidance.
QA/QC procedures to be applied:	Tests will be undertaken by experienced project staff following the Stove Manufacturers Emissions & Performance Test Protocol (EPTP)[29]. Staff will follow the procedure used in the EPTP and record the thermal efficiency of each stove tested, which will be subsequently uploaded to the monitoring database for emissions calculation purposes. Any variation from the baseline efficiency will be applied to the emissions calculations in the monitoring reports. In the case of any variation in efficiency from the baseline, a larger sample of stoves may be selected to ensure greater accuracy. During the first annual or biennial period, the baseline tested figure will apply for interim monitoring reports.
Any comment:	

Data / Parameter:	B_{new}
Data unit:	Tonnes per annum
Description:	Quantity of biomass saved per stove per annum
Source of data used:	Monitoring survey
Value of data applied for the purpose of calculating expected emission reductions:	n/a; will only be available ex-post
Description of measurement methods and procedures to be applied:	Annually or biennially, a simple random sample of installed stoves will be selected from the monitoring database to determine if they are still operating or are replaced by an equivalent in service appliance. The activity sample group (ASG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 & 5. B_{new} monitoring shall ensure that: (a) Either the replaced low efficiency appliances are disposed of and not used

[29] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

	within the boundary or within the region; or (b) If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from B_{old}. The ASG survey will check the presence of domestic 3-rock fires in the household of stove recipients and the survey questionnaire will be used to ascertain the patterns of usage of each appliance. An average proportion of usage of 3 rock fires shall then be calculated across the ASG and a deduction made to B_{old}, where appropriate.
QA/QC procedures to be applied:	The latest version of the survey form "3RL Activity Monitoring Survey" will be used to gather data on patterns of appliance usage for each survey participant. Where residual use of 3 rock fires is found in the ASG, the proportion of usage will be derived as a fraction and applied as a correction factor to B_{old}. In case of any variation from B_{old} a greater sample size may be selected for increased accuracy. During the first annual or biennial period, the baseline figure will apply for interim monitoring reports.
Any comment:	

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

CPAs included in this PoA will be homogenous in nature, as they are applying a common technology and the technology will have common usage patterns. The commonality of usage patterns was demonstrated during the baseline surveys of woodfuel usage and the technology is a specific response to this usage (i.e. biomass fuel utilized on a 3 stone fire solely for household purposes).

In accordance with EB69 Annex 4: STANDARD FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES; sampling activities will be undertaken at the PoA-level and the sampling plan presented here will apply to the group of CPAs to be included in the PoA. To comply with the guidelines and the methodology, samples will be calculated on either on a 95/5 confidence/precision basis for biennial surveys or 95/10 for annual surveys, to comply with monitoring requirements for a group of CPAs (EB69, Annex 4).

In accordance with the Sampling Standard[30] the parameter values for (1) the stove usage rate, and (2) the stove efficiency are estimated by sampling in accordance with the requirements in the applied methodology using a single sampling plan covering a group of CPAs[31], applying either a 95/10 for annual or 95/5 for biennial confidence/precision for the sample size calculation. A single sampling plan covering a group of CPAs is justified when either the homogeneity of included CPAs relative to the parameters of interest can be demonstrated or the differences among the included CPAs is taken into account in the sample size calculation.

Therefore, a single sampling plan is justified as the proposed PoA involves CPAs that are homogenous and there is homogeneity related to parameters of interest, as described below:

[30] Standard for sampling and surveys for CDM project activities and programme of activities, EB69 Annex 4, para 20 (including footnote 18)

[31] That is, the populations of all CPAs in the group are combined together, the sample size is determined and a single survey is undertaken to collect data

Stove usage rate (ASG) parameter of interest:

- Every CPA has the same stove technology user profile (i.e. domestic households)
- Every CPA employs the same stove technology
- The baseline survey shows that household usage of fuel wood and cooking technology (i.e. 'three rocks' method) in Zambia is homogenous across regions

Stove efficiency (SESG) parameter of interest:

- Every CPA employs the same stove technology
- Each final constructed stove is robust, manufactured to identical standards and with no moving parts, and therefore efficiency is designed to remain constant over time
- Every CPA applies the same stove installation process and therefore each stove is an exact replica of all the others in similar (i.e. domestic household) locations
- Every CPA has the same Implementing Entity, meaning each stove is installed and monitored in the same manner

Therefore as the technology and construction of each stove is homogenous, every CPA is homogenous relative to the stove efficiency[32]

Thus a single sampling plan covering a group of CPAs is justified. The only relevant difference between CPAs arises from the date of installation of stoves. To take account of this, a number of measures have been employed for monitoring the overall average performance of stoves included in the PoA and for accurately calculating their emissions reductions:

1) A simple random sample is selected from all stoves included the PoA, regardless of installation date in the monitoring database, for both parameters of interest
2) Emissions Reductions are calculated on a per stove per day basis, by counting the number of operating days of each stove from the date of installation and aggregating the emissions reductions, applying the homogenous stove usage rate obtained through sampling for all stoves
3) Emission Reductions are calculated applying the homogenous stove efficiency obtained through sampling for all stoves. The same efficiency is applied regardless of the date of installation, giving an accurate picture of average stove usage and efficiency across the PoA. Thereby, the differences in installation date are taken into account by monitoring a simple random sample of all stoves and averaging performance in the emission reduction calculations[33]
4) The sample sizes for the stove usage rate and stove efficiency are calculated conservatively

These measures, combined with the high degree of homogeneity between CPAs, means that the application of a single sampling plan covering a group of CPAs is justified in line with the Sampling Standard.

Stoves installed under each CPA will have a CPA identifier tag in the PoA monitoring database.

[32] Even if efficiency were to deteriorate slightly over time, a simple random sample would still find the correct average efficiency

[33] The monitoring report will show the correlation between stove efficiency and the year (or 'vintage') of installation, proving that the sample is homogenous. In the unlikely scenario where the sample is shown not to be homogenous in this regard, a stratified approach to analyzing the data will be applied and emissions reductions per stove will be calculated according to the vintage of installation.

Emissions reductions generated by CPAs included in the PoA will be monitored by 3RL via the monitoring database and through the implementation of this monitoring plan, using a sampling technique where indicated. Emissions reductions for each CPA will be calculated using the data contained in the monitoring database and from the monitoring surveys. A monitoring report describing monitoring activities and calculated emissions reductions will be produced for each monitoring period.

EB 69 Annex 4 indicates a series of requirements for sampling plans where parameter values are determined using sampling. The following sampling plan will enable the determination of parameter values for the calculation of emissions reductions:

a) Sampling Design

i. Objectives & Reliability Requirements

The objective of this plan is to enable the determination of parameter values for parameters monitored under the PoA and described above in E.7.1. The objective of this sampling plan is to ensure a statistically accurate sample of the population will deliver the confidence/precision required by the methodology and the guidance in EB69 Annex 4. This is specific to each survey. The plan will also outline the timeframe of the estimated parameter value.

Survey data will provide the key parameter values for emissions reduction calculations, where sampling is indicated for parameter determination. Two surveys will be conducted to ascertain the required monitored parameter values, these are:

Activity Sample Group (ASG)

Parameters to be monitored:

- Number of Stoves (*NS*) – to determine the number of stoves still operation during the monitoring period, as compared to the baseline installed number of stoves.
- Quantity of biomass saved per annum (B_{new}) – to determine the average deduction per stove from the baseline parameter B_{old}. This monitors any residual use of the baseline appliance.

The ASG will be selected from the monitoring database and the survey conducted either annually, on a 95/10 precision basis, or biennially, on a 95/5 precision basis.

Stove Efficiency Sample Group (SESG)

Parameter to be monitored:

- Efficiency of stove ($\eta_{new,i}$) – to determine the ongoing average efficiency of each stove installed.

The SESG will be selected from the monitoring database and the survey conducted either annually, on a 95/10 precision basis, or biennially, on a 95/5 precision basis.

ii. Target Population

The target population for each survey to be determined by sampling is as follows:

a. **ASG** - the population is the total number of stoves installed under all CPAs included in the PoA, as derived from the monitoring database. The sampling frame is identified through the unique references allocated in the monitoring database.
b. **SESG** – the population is the total number of stoves installed under all CPAs included in the PoA, as derived from the monitoring database. The sampling frame is identified through the unique references allocated in the monitoring database.

iii. Sampling Method

The sampling method for each survey is determined by using a simple random sample of the total population of installed stoves, from records generated in the monitoring database and based on the precision requirements listed above and required by the methodology and guidance in EB 69 Annex 4.

iv. Sample Size

The sample size for each monitoring activity will be calculated utilizing the population size as it exists at the time of the monitoring survey (i.e. the total number of stoves installed and included in the monitoring database). Samples will be calculated on a simple random sample basis.

The desired precision is stated above for each parameter above and corresponds to those values required by the EB69 Annex 4 Guidance for a group of CPAs.

A sample size will be calculated separately for each of the sample groups: ASG and SESG. These will be calculated according to the Best Practice Examples for Sample Size Calculations outlined in EB69 Annex 5 Appendix A Guidance. A simple random sample will be selected for determining each parameter value. As the parameter of interest is different for each sample group, a separate approach is adopted:

Activity Sample Group (ASG)

Parameter of interest is a percentage: the proportion of stoves still in operation during the monitoring period. Therefore, Example 1 of EB69 Annex 5 Appendix A is chosen: ***Proportional parameter of interest (Cook stove project)*** Example 1 – Simple Random Sampling:

- Here the proportional parameter of interest is currently 97%, which is based on 3RL's existing experience of monitoring stoves in operation in the field[34], (from guidance in EB 69 Annex 5 Appendix A: *In a situation where we do not have any information from previous studies, we could take a preliminary sample as a pilot and use that sample to provide our estimates*), however, in the interests of conservativeness, we will illustrate a sample size based on the scenario outlined in the guidance in EB 69 Annex 5 Appendix A, which indicates an estimated parameter of interest at 50%.
- This value is expected to alter through the lifetime of the project and, at the point of calculating sample sizes for each survey, an up-to-date assessment will be made.
- The Z-score of 1.96[35] is selected to reflect the higher level of confidence required for grouped CPA monitoring (95%).

[34] See 3RL Zambia monthly report April 2012

[35] http://www.mypivots.com/dictionary/definition/233/z-score

To provide a provisional forecast of sample sizes, we present sample sizes for both annual and biennial surveys and for a population of both a single included CPA (at 15,938 stoves) and the anticipated total number of stoves to be included in all CPAs (400,000). Full details of the calculations, according the Best Practice Examples for Sample Size Calculations outlined in EB69 Annex 5 Appendix A Guidance, are presented in the spreadsheet "sample size calculations":

	ASG Monitoring			
	Annual Surveys		Biennial Surveys	
confidence (z score)	1.96	1.96	1.96	1.96
z score squared	3.8416	3.8416	3.8416	3.8416
number of households (N)	400,000	15,938	400,000	15,938
expected proportion (p)	0.5	0.5	0.5	0.5
p(1-p)	0.25	0.25	0.25	0.25
	384,160	15,307	384,160	15,307
N-1	399,999	15,937	399,999	15,937
relative precision	10%	10%	5%	5%
precision squared	1.00%	1.00%	0.25%	0.25%
proportion squared	0.25	0.25	0.25	0.25
z score squared	3.8416	3.8416	3.8416	3.8416
p(1-p)	0.25	0.25	0.25	0.25
	1,000.96	40.80	250.96	10.92
sample size	384	375	1,531	1,402

In accordance with EB 69 Annex 4, if the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen.

Stove Efficiency Sample Group (SESG)

Parameter of interest is a mean value: the average efficiency of stoves still in operation during the monitoring period. Therefore, Example 5 of Best Practice Examples for Sample Size Calculations outlined in EB69 Annex 5 Appendix A Guidance is chosen: ***Mean value parameter of interest (CFL project)*** Example 5 – Simple Random Sampling:

- Here the mean value parameter of interest is the baseline tested 29.5% thermal efficiency.
- The standard deviation was calculated to be ±2.8%. This is based on the experience and data from the baseline lab tests, and is supported by a statement from the Engines and Energy Conversion Laboratory of Colorado State University. However, in the interests of conservativeness, we will illustrate a sample size at a standard deviation of ±30%.
- The Z-score of 1.96 is selected to reflect the higher level of confidence required for grouped CPA monitoring (95%)

To provide a provisional forecast of sample sizes, we present sample sizes for both annual and biennial surveys and for a population of both a single included CPA (at 15,938 stoves) and the anticipated total number of stoves to be included in all CPAs (400,000). Full details of the calculations, according the Best

Practice Examples for Sample Size Calculations outlined in EB69 Annex 5 Appendix A Guidance, are presented in the spreadsheet "sample size calculations":

	SESG Monitoring			
	Annual Surveys		Biennial Surveys	
V	1.03	1.03	1.03	1.03
expected mean	29.5%	29.5%	29.5%	29.5%
standard deviation	30.0%	30.0%	30.0%	30.0%
confidence (z score)	1.96	1.96	1.96	1.96
number of households (N)	400,000	15,938	400,000	15,938
relative precision	10%	10%	5%	5%
z score squared	3.8416	3.8416	3.8416	3.8416
number of households (N)	400,000	15,938	400,000	15,938
V	1.03	1.03	1.03	1.03
	1,589,171	63,321	1,589,171	63,321
N-1	399,999	15,937	399,999	15,937
precision squared	1.00%	1.00%	0.25%	0.25%
confidence (z score) squared	3.8416	3.8416	3.8416	3.8416
V	1.03	1.03	1.03	1.03
	4,003.96	163.34	1,003.97	43.82
	397	388	1,583	1,445

It must be noted that the conservative parameters of interest used in the above calculations are for illustration only and that, during actual sampling for monitoring exercises, these parameter values will reflect accurate data collected during the operation of the project.

The population for each monitoring period will be relative: i.e. the number of stoves installed in the group of CPAs at the time of monitoring. Therefore the above calculations are just estimates for illustration. Furthermore, oversampling will be conducted to ensure that the required level of precision is met.

In accordance with EB 69 Annex 4, if the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen.

v. Sampling Frame

The sampling frame is the data included within the PoA monitoring database, where every stove installed in each PoA is recorded individually. Individual characteristics apply to each survey group:

a. *SESG* – the population is the total number of stoves installed under all CPAs included in the PoA, as derived from the monitoring database. The sampling frame is identified through the unique references allocated in the monitoring database.
b. *ASG* – the population is the total number of households where a stove has been installed, under all CPAs included in the PoA, as derived from the monitoring database. The

sampling frame is identified through the unique references allocated in the monitoring database.

b) Data

i. Field Measurements

Field activities to be undertaken for each parameter to be monitored are as follows:

NS and B_{new} – each household in the activity sample group (ASG) will be surveyed using the "3RL Activity Monitoring Survey" to determine to determine if they are still operating or are replaced by an equivalent in service appliance:

- Monitoring staff shall complete an observational check to see that the stove is still located in the same place identified by the installation data and observe that it is still being used
- Monitoring staff shall ask users to confirm that the stove is being used for the recipient household's domestic purposes
- Monitoring staff shall confirm that the old appliance (3-rock fire) has been effectively disposed of, and, if not;
- Monitoring staff shall ascertain residual usage of the domestic 3-rock fire. If this usage includes cooking, water heating or space heating (i.e. those usages measured in the baseline survey), then the average annual wood fuel used for these purposes shall be calculated as a proportion of overall average annual wood fuel usage. This proportion will form any percentage deduction from B_{old} and will be applied to emissions calculations in each monitoring report.

$\eta_{new,i}$ – each stove in the stove efficiency sample group (SESG) will be tested according to the manufacturers' EPTP. This test comprises a Water Boiling Test as required by the methodology. Data will be collected from each stove tested and an average efficiency value from the SESG will be calculated. The efficiency fraction will be applied to emissions calculations in each monitoring report.

ii. Quality Assurance/Quality Control

Data collection will be conducted by a dedicated 3RL monitoring team of trained individuals utilizing survey questionnaires and instruments required for measurements

In order to minimize non-sampling errors, such as non-responses and errors, the field team will practice over-sampling from the population to ensure a total number respondents that meets the required level of precision. This will ensure the integrity of the sample group and maintains the randomness of participant selection. All samples groups will be re-selected for each monitoring period / year, as appropriate for the parameter in question.

Where a survey may not be completed, or where there is a non-response, the reasons shall be clearly documented in the survey questionnaire. In order to account for outliers, the lowest 5% and the highest 5% of the surveyed values will be removed from the final calculation.

iii. Analysis

Completed questionnaires will be collected by the survey groups and delivered to a central office for processing. These shall be checked through for errors and completeness, and compiled into a survey

report. Any incomplete or missing survey questionnaires shall be documented clearly. The survey report will include:

- A summary of activities undertaken, at which location and on which dates
- A summary of data collected and mean values
- A calculation of the parameter values to be utilized in emissions reduction calculations based on the sample mean values

c) Implementation

i. Implementation Plan

The implementation of monitoring each random sample selection will be the responsibility of 3RL and its specifically trained monitoring team. This team will comprise local operatives who are conversant in local languages and customs of rural Zambia. Individuals will be selected based on their competence and experience for each monitoring activity.

There will be no incentives provided for these individuals for the type of data provided, to prevent any conflict of interest.

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

26/04/2012
Nick Marshall
3 Rocks Ltd.

Annex 1

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

Organization:	3 Rocks Ltd.
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Represented by:	
Title:	Company Secretary
Salutation:	Mr.
Last Name:	Minty
Middle Name:	
First Name:	Bobby
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding will be made available for the proposed PoA, or any CPA under the proposed PoA.

Annex 3

BASELINE INFORMATION

1. *By, appliance* The average quantity of woody biomass used per appliance in absence of the project.

CEEEZ
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Energy, Environment and
Engineering Zambia Limited

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3 Rocks Ltd
17A York Street
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JE2 3RQ

15th March 2011

Dear Sirs

Baseline Woodfuel Survey Report

CEEEZ was given the task of finding out the average annual domestic woodfuel use across households in Zambia using a survey method to define a key baseline parameter for the proposed Programme of Activities: Fuel Efficient Stoves in Zambia.

The Sampling Plan for Household Annual Average Woodfuel Usage Survey entailed our selection of four distinct areas and interviews with 120 randomly selected householders in both the wet and dry seasons in Zambia; during July 2010 and March 2011 (we practised oversampling for ease of survey distribution and in order to improve accuracy). The wood used solely for domestic purposes (cooking and water heating) for a typical day was weighed using hanging scales.

Our Consolidated Baseline Woodfuel Survey Report gives the full details on the methodology for conducting the surveys and the findings. We are writing to confirm that the findings show, after removal of 'outliers' in the data, an average annual woodfuel use for domestic purposes in Zambia of 4.1 tonnes per annum.

Yours faithfully

Professor Francis Yamba (M.Sc Ph.D. Hon FEIZ. R. Eng.)
Centre For Energy Environment And Engineering Zambia (CEEEZ) Ltd.
176 Pairenyatwa Road
Suite B. Fairview
P/B E721

In advance of conducting the field surveys, desk research was completed to ascertain values from previous studies. Zambia has a population of 9,885,591 according to the official 2000 census[36]. The total number of household heads is 1,884,741, giving an average figure of 5.25 persons per household.

The Food and Agriculture Organization (FAO) of the United Nations published a "Woodfuel review and assessment in Zambia"[37] indicating that, in 1999, the Zambian Forestry Department calculated a per capita average annual woodfuel usage of 1.025 tonnes per annum.

This would give an average woodfuel usage figure per household per annum of **5.38 tonnes** (5.25 x 1.025).

In July 2010 and March 2011, a survey of average per household per diem woodfuel usage was commissioned by 3RL. The sampling approach to identify households was based on available guidance (General Guidelines For Sampling And Surveys For Small-Scale CDM Project Activities [Version 01]; CDM EB50 Annex 30) and the multi-stage sampling approach was selected. The surveys were undertaken by independent experts, the Centre for Energy, Environment and Engineering Zambia Ltd (CEEEZ), in both the wet and dry seasons and in 4 distinct regions of Zambia.

The sampling approach taken is outlined in 3RL's Sampling Plan for Household Annual Average Woodfuel Usage Survey, available for review by the DOE at validation. The Consolidated Baseline Wood Fuel Survey Final Report by CEEEZ (March 2011) is also available for review by the DOE at validation and is summarized here:

The main objective of the baseline wood fuel survey was to establish the current daily mean wood fuel consumption per household in Zambia. The second objective was to establish demographic setting, cooking habits and socio economic aspects of the selected areas. This was for the purpose of understanding the implications of such factors on wood fuel consumption in household.

The methodology employed in this survey to gather data involved meeting key stakeholders, sampling target areas, use of open-ended questions at focus group discussions, guided questionnaires for households, and actual wood fuel measurement. The survey was conducted in the two main seasons in Zambia; the rainy season, completed in March 2011, and the dry season, completed in July 2010.
A 3-stage, geographical cluster sampling approach was used, according to the EB guidance for Sampling and Surveys for Small-Scale CDM Project Activities, as outlined in EB meeting 50 Annex 30. With regard to the country of Zambia, population clusters occur naturally within political regions and districts, mostly as villages.

Village meetings were held in each of the selected areas (Mpika, Nyimba, Masaiti and Kaoma) at which the aim of the survey was explained in detail. Wood fuel measurements were conducted on three consecutive days in the selected survey sites. Wood stocks were weighed at the start and at the end of the day; the difference being the total consumption of woodfuel on that day. The results of the measurements were then averaged in order to establish actual daily consumption of firewood per household.

Based on the analysis of the survey undertaken in the four regions of Zambia, it was observed that all selected households use firewood as a major source of energy for cooking. All participants in the study own three stone fire-stoves which they use in separate kitchens or in the open yards.

[36] http://www.zamstats.gov.zm/census.php

[37] http://www.fao.org/docrep/004/X6802E/X6802E00.htm#TOC

Only woodfuel used for day-to-day domestic purposes was measured (cooking, water heating and space heating). Additional woodfuel is used in communal three stone fires for beer brewing and socializing. Communal use woodfuel was not included in the survey measurements, as it is not consumed for domestic purposes. Once data was collected from the surveys, and the outliers removed, the national average daily domestic woodfuel consumption was calculated at 11.25kg, or 4.1 tonnes per annum.

In order to be conservative, the selected figure comes from the survey data collected above (as opposed to the higher researched figure), and therefore:

B_{old} = **4.1 tonnes per household**

η_{new} Efficiency of the system being deployed

November 11, 2010

ENGINES & ENERGY CONVERSION LAB

DEPARTMENT OF MECHANICAL ENGINEERING
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Emissions and Performance Report

The stove listed below has been tested in accordance with the "*Emissions and Performance Test Protocol*", with emissions measurements based on the biomass stove testing protocol developed by Colorado State University (available at www.eecl.colostate.edu).

Stove Manufacturer:	Envirofit International
Stove Model:	Z-3000
Test Dates:	9/16/2010-9/28/2010
Average Thermal efficiency:	29.5%
80% Confidence Interval:	29.2-29.9

The above results are certified by the Engines and Energy Conversion Laboratory at Colorado State University. All claims beyond the above data are the responsibility of the manufacturer.

Morgan DeFoort
EECL Co-Director
Technical Lead, Biomass Stoves Testing Program

In September 2010, the proposed PoA's selected stove model was tested by the Engines & Energy Conversion Lab of Colorado State University (EECL), according to the Stove Manufacturers Emissions & Performance Test Protocol (EPTP)[38]. The protocol was co-developed by the EECL, the Shell Foundation, Envirofit International and Phillips.

The test report summary is shown above and the baseline average thermal efficiency is calculated as:

$\eta_{new} = \mathbf{0.295}$

[38] Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

2. $f_{NRB,y}$ Non-renewable biomass fraction

f_{NRB} is the fraction of woody biomass saved by the project activity in year y that can be established as Non-Renewable Biomass (NRB). It has a range from 0 to 1, where 1 equates to 100% of the woody biomass saved by the project being non-renewable. According to the methodology this is calculated with the following equation:

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

Where,
DRB – Demonstrably Renewable Biomass, tonnes;
NRB – Non-Renewable Biomass, tonnes.

Non-Renewable Biomass is the quantity of woody biomass used in the absence of the project activity (B_y) minus the DRB component, and can be calculated using the following equation:

$$NRB = B_{old} - DRB \quad (2)$$

Calculating B_{old}:
B_{old} can be calculated by multiplying the amount of fuelwood used per person per year by the total number of people in the project area. In this case study the project area is the whole of Zambia. Estimates of per capita consumption of firewood and charcoal for rural and urban households were obtained from a study by the Government of Zambia's Ministry of Environment and Natural Resources [2]. Rural and urban population estimates were obtained from the 2010 national population census [3], which cited a total population of 13,046,058, with an estimated rural:urban ration of 61:39 [3]. To estimate total national fuel demand in terms of woody biomass, the conversion of wood to charcoal was assumed to be 15% efficient[4]. Woodfuel demands in urban and rural Zambia are summarised in Table 1 below.

Table 1: Estimates of urban and rural population, and rates of fuelwood consumption in Zambia

	rural	urban	total
Population	7,958,095	5,087,963	13,046,058
Firewood consumption (kg person^{-1} yr^{-1})	1,025	240	
Charcoal consumption (kg person^{-1} yr^{-1})	73	139	
Total woodfuel consumption (t yr^{-1})	12,020,199	5,935,956	**17,956,155**

Using cited population estimates and total fuelwood use, the estimated annual demand for woodfuel in Zambia, B_{old}, is **17,956,155** tonnes per annum, including charcoal.

Calculating DRB:

DRB is calculated as the annual growth of DRB stocks in Zambia. Initially, total DRB stocks must be estimated (from government data) and then the annual DRB growth stocks derived from this data. This will determine the share of DRB in B_{old}, as per the methodology.

The total growing stock of forests in Zambia is reported [6][7] as ranging from 1,307,000,000 m^3 to 2,755,380,000 m^3. An average of 2,031,190,000 m^3 was used for the calculations below. Forestry management in Zambian forests has been declining since the 1980s due to a steady reduction in public funding[8]. Consequently, the assumption that forests in national parks and reserves fulfil the above criteria may be misleading. It is difficult to quantify exactly the extent of and the area of poor management, and consequently the reduction in DRB area. What is evident is that there is considerable illegal harvesting of trees and expansion of settlements in GMAs[9] and open forest or forest reserves[10] Furthermore, the lack of resources available to the Forestry Department has lead to unsustainable forest management practices and poor enforcement of those practices that work[11][12]. Of the total forest growing stocks: "only 6.5 percent are strictly national forest reserves managed as protected forests and no harvesting of wood resources is permitted on these forests"[11].

Based on data from ILUA, the Zambia Forest Resource Assessment (FRA) for 2010 estimated total forest area to be 49.5 x 106 hectares after accounting for likely changes in forest cover and other wooded land since the ILUA's reference year of 2007.[39] [40] The same report noted that Zambia's forests had undergone a slight decrease in forested area but more importantly were subject to widespread degradation.[41] Zambia's 2009 report to the Convention on Biodiversity (CBD) estimated that over 50% of Zambia's forest reserves had been depleted by overexploitation for subsistence and commercial use.[42] The management of Zambia's forest sector is challenged by limited funding and capacity and as a result there are few sustainably managed areas where forest law can be effectively enforced.[43] [44] [45] Protected areas devoted to management of forest and wildlife resources are subject to illegal exploitation and encroachment by human populations.[46] [47] Deforestation and degradation of woodlands due to firewood

[39] Zambia Forestry Department. (2009) Integrated Land Use Assessment (ILUA) 2005 - 2008. Available from: http://www.fao.org/forestry/17642- 08c7545f2349615e80a6551745f51f62f.pdf

[40] FRA. (2010) Global Forest Resources Assessment Country Report: Zambia. Available from: http://www.fao.org/docrep/013/al575E/al575e.pdf

[41] Ibid.

[42] MTERN. (2009) Fourth National Report on the Implementation of Convention on Biodiversity in Zambia. Ministry of Tourism, Environment and Natural Resources, Republic of Zambia. Available from: www.cbd.int/doc/world/zm/zm-nr-04-en.doc

[43] Mupimpila, C., Sheshamani, V., Mwanza, A., Chidumayo, E., Mwanawina, I., and Cromwell, E. (1995) *Structural adjustment and sustainable development in Zambia*. Overseas Development Initiative: London, UK.

[44] Taulo, C.M. and Mulombwa, J. (1998) Zambia Country Report in: EC-FAO Proceedings of sub-regional workshop on forestry statistics SADC region. Data collection and analysis for sustainable forest management in ACP countries - linking National and International efforts. EC-FAO Partnership Programme (1998 - 2002). Available from: ftp://ftp.fao.org/docrep/fao/003/X6685E/X6685E00.pdf

[45] UNDP. (2010) *UN Collaborative programme on reducing emissions from deforestation and forest degradation in developing countries: National Joint Programme Document*. (UN-REDD/PB4/4ci/ENG). FAO, UNDP and UNEP: New York, NY. 126 pp.

[46] Bwalya, S.M. (2004) *Rural Livelihoods and Collective action in Joint Forest Management in Zambia*. Series: SAGA Competitive Grants Program Final Report. Clark Atlanta University: Georgia, USA. 44 pp.

[47] Namugala, C. (Hon). (2009) *Ministerial statement on the removal of illegal settlers from the prime wildlife areas of Sichifulo Game Management Area.* Parliamentary address. Zambian Ministry of Tourism, Environment and Natural Resources.: Lusaka. 6 pp.

and charcoal harvesting is widespread, particularly in areas close to roads and urban centres.[48] [49] [50] Some forest reserve areas were excised and de-gazetted by government in response to encroachment and depletion of resources.[51]

Only 23% of forests have any form of formalised management plan, which includes forest reserves as well as national parks, game management areas, and other categories of state land where woodfuel collection and cutting timber is illegal.[52] [53] However, the Forest Resource Assessments undertaken by the Food and Agriculture Organisation do not recognise any forest areas in Zambia as being under sustainable management, including those aforementioned areas of forest with a management plan.[54] The International Forest Stewardship Council also does not recognise or certify any sustainable managed forest area in Zambia.[55] Very few forested areas in Zambia fulfil all criteria for DRB given that:

- deforestation and degradation are widespread;
- no formalised sustainable management plans are apparent; and
- forest/protected area laws are not widely enforced or adhered to

ILUA noted that only 6.5% of Zambia's forest reserve estate is designated as 'strict reserve' areas which can be considered to be permanent forest estate.[56] The FRA also adopted the interpretation of these forests as areas of permanent forest estate.[57] Consequently the latter areas are considered the most reliable means of defining the forested areas that conform to the criteria for DRB, where 'strict forest reserves' are managed to ensure that forested area and carbon stocks will remain constant or increase and that all relevant national laws are complied with.

[48] Chidumayo, E.N. (1991) Woody biomass structure and utilisation for charcoal production in a Zambian Miombo woodland. *Bioresource Technology* 37(1),43–52.

[49] Chidumayo, E.N. and Aongola, L. (1998) Zambia biodiversity strategy and action plan: the country study report. International Union for Conservation of Nature, Lusaka.

[50] Chidumayo, E.N. (2009) *Determining the non-renewable portion of biomass utilized in charcoal production for Lusaka.* CDM Document. UNFCCC. http://cdm.unfccc.int/UserMangagement/FileStorage/65G9VAZKYPMJO2TUQBXW38D7LFEN01

[51] MTERN. (2009) Fourth National Report on the Implementation of Convention on Biodiversity in Zambia. Ministry of Tourism, Environment and Natural Resources, Republic of Zambia. Available from: www.cbd.int/doc/world/zm/zm-nr-04-en.doc

[52] Zambia Forestry Department. (2009) Integrated Land Use Assessment (ILUA) 2005 - 2008. Available from: http://www.fao.org/forestry/17642- 08c7545f2349615e80a6551745f51f62f.pdf

[53] FRA. (2010) Global Forest Resources Assessment Country Report: Zambia. Available from: http://www.fao.org/docrep/013/al575E/al575e.pdf

[54] Ibid.

[55] FSC. (2012) Global FSC certificates: type and distribution. Available from: http://ic.fsc.org/facts-figures.19.htm, ic.fsc.org/download.facts-and-figures-december- 2012.693.pdf [Accessed December 20, 2012]

[56] Zambia Forestry Department. (2009) Integrated Land Use Assessment (ILUA) 2005 - 2008. Available from: http://www.fao.org/forestry/17642- 08c7545f2349615e80a6551745f51f62f.pdf

[57] FRA. (2010) Global Forest Resources Assessment Country Report: Zambia. Available from: http://www.fao.org/docrep/013/al575E/al575e.pdf

This percentage is used as an estimate of the proportion of forest growth stocks that fulfil the criteria of demonstrably renewable woody biomass. This is under the methodological DRB condition 1: the woody biomass is originating from land areas that are forests where:

(a) The land area remains a forest; and

(b) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(c) Any national or regional forestry and nature conservation regulations are complied with.

Cubic meters of wood can be converted into tonnes of wood by multiplying by the wood density. This figure of wood density varies according to species and consequently an appropriate average wood density was sought. Zambia has several woodland types, with miombo the most prominent. Wood densities of a wide range of Zambian species were used to determine a range from light to heavy densities. A typical Zambian species with light wood is *Sterculia acuminata* (bitter cola; density 0.25 to 0.6 t/m3)[13]. A typical Zambian species with hard wood is *Diospyros mespiliformis* (a variety of ebony found in Zambia; density 0.77 to 0.85 t/m3)[13]. The extremities of this range consequently cover most Zambian woodland species. The appropriateness of the range is further confirmed by observing the wood density of a wide range of *Brachystegia* spp. which are characteristic species found in miombo woodlands i.e. the predominate woodland type in Zambia. An intermediate value in the range (0.55 t/m3) was deemed as an appropriate average in terms of a best estimate. This is confirmed by the FAO value of 0.56 t/m3[18]. See table below:

Wood density (FAO, 2003)

Tropical Region	Mean	Common-range
Africa	0.56	0.50-0.79
America	0.6	0.50-0.69
Asia	0.57	0.40-0.69

Woody density for a wide range of species therefore has been documented as ranging from 0.25-0.85 t m^{-3}. We chose an intermediate value of **0.55** t m^{-3} to use as an average wood density in Zambia.

The total DRB stocks in Zambia is calculated by multiplying the total average growing stock by the proportion of that which is deemed renewable and the average wood density. This is calculated to be **72,615,043** t (2,031,190,000 x 6.5% x 0.55).

To obtain the annual DRB stocks, the total standing DRB is multiplied by the annual growth rate of that biomass, shown as a percentage of the total biomass, or Mean Annual Increment (MAI). The MAI of miombo woodland has been reported[15] as ranging from 0.4% - 3.5% annually. In Zambian forest reserves MAI has been reported as 1.57%.[15] Miombo woodland comprises nearly half of all Zambian woodland, and is generally faster growing than teak or mopane forest, and consequently estimation using these rates can be considered conservative. Based on the range of annual growth reported for miombo woodland and that reported for forest reserves, an average growth rate of 1.76% was used in the calculations. This is conservative as the average includes forest areas of poor and no management, which do not meet the DRB criteria.

Therefore, the annually available DRB is **1,278,025** t yr^{-1} (72,615,043 x 1.76%).

Calculating NRB:
Non-renewable woody biomass is supported by the following indicators:

- **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;**

Total living biomass carbon stocks (including both above- and below-ground biomass) have depleted from 2578.68 million tons in 1990 to approximately 2415.96 million tons in 2010[6]. The annual loss in biomass carbon has been estimated[16] at between 12.8 and 29.9 mega tonnes of carbon per year.

- **Trends in the type of cooking fuel collected by users, suggesting scarcity of woody biomass.**

"Most households have no alternative to firewood and charcoal. The increasing exploitation of trees for charcoal has contributed to deforestation."[17]

"The high demand for woodfuel has resulted in non-species selective cutting regimes being applied by many woodfuel producers, culminating in severe depletion of many forest ecosystems and the resultant land degradation. Since rural communities can now neither find productive land nor meet the costs for agricultural inputs, the implied situation is one that perpetuates forest destruction irrespective of tree size, species and/or quality."[2]

The values of B_{old} and DRB, calculated above, were inserted into equation (2) to calculate the annual NRB for Zambia.

Thus NRB is B_{old} -DRB = **17,956,155 –1,278,025= 16,678,131 million tonnes yr^{-1}.**

Calculating *fNRB*:
Using equation (1), $f_{NRB,y}$ is calculated as NRB/(NRB+DRB) = 16.678/(16.678+1.278) (million tyr^{-1})

Therefore, $f_{NRB,y}$ = **0.93**

The PP shall also provide evidence that the trends identified are not occurring due to the enforcement of local/national regulations

The trends identified here in this report are not occurring due to the enforcement of local/national regulations. The demand for woodfuel and increase in deforestation is driven primarily by increases in population, as evidenced by census data from Zambia[58], and the prevailing levels of poverty in the country. "The rural sector entirely depends on charcoal or firewood for many things but even in urban areas people are using charcoal because they cannot afford to use electricity all the time," [59]

The enforcement of local/national regulations regarding forest protection is weak: "Approximately 57% of Zambia's land area is forested, although there is no primary forest remaining. More than 40% of the country is within protected parks, although this does not prevent widespread poaching and deforestation

[58] http://www.zamstats.gov.zm/census.php

[59] http://www.postzambia.com/post-read_article.php?articleId=20579

from taking place. Since 1990, Zambia has lost over 13% of its forest cover and the deforestation rate is slowly rising. It was one of the top 10 countries for deforestation between 2000 and 2006."[60]

The Food and Agriculture Organization (FAO) of the United Nations cites trends that drive deforestation and the use of non-renewable biomass that are independent of local/national regulations: "Rural communities are completely dependent on fuelwood for cooking and heating… The high demand for woodfuel has resulted in non-species selective cutting regimes being applied by many woodfuel producers, culminating in severe depletion of many forest ecosystems and the resultant land degradation. Since rural communities can now neither find productive land nor meet the costs for agricultural inputs, the implied situation is one that perpetuates forest destruction irrespective of tree size, species and/or quality."[61]

As noted above, the Zambian National Policy on the Environment (2007) indicates areas where Zambian policy and regulation is not adequately protecting environmental resources, including:

- widespread forest clearance and degradation
- forest degradation leading to reduced biodiversity
- fuel-wood demand increased and alternative energy not given sufficient attention at all levels
- Policy failure to invest more in increased access to electricity and insufficient attention and investment in low-cost alternative supplies, to offset pressure upon wood resources
- Inadequate attention in both use and regulation of the main sources of supply of energy, hydro-power and fuel-wood, to their environmental impacts and requisite amelioration in sectoral policies
- The pace of rural electrification is too slow thus compounding the pressure upon wood resources in proportion to the rapid increase in the human population

Furthermore, the policy seeks to encourage 'implementation strategies' that will: "focus more on establishing an enabling environment to promote community-based sustainable natural resource use and less on traditional government managed development projects."

These implementation strategies are not effective, evidenced by the FAO Global Forest Resources Assessment (FRA) Country Report of Zambia indicating that forested and other wooded land has been steadily decreasing between 1990 and 2010.[62]

	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]
Zambia	52800	51134	50301	49468	-167	-0.32	-167	-0.33	-167	-0.33

There is therefore clear evidence that the trends towards non-renewable biomass usage and deforestation, identified in this report, are increasing rather than decreasing, and that the calculation of *fNRB* is conservative in nature.

[60] http://www.illegal-logging.info/approach.php?a_id=192

[61] FAO Woodfuel review and assessment in Zambia; National woodfuel consumption patterns: http://www.fao.org/docrep/004/x6802e/x6802e05.htm#4276

[62] Global Forests Resources Assessment 2010, FAO (http://www.fao.org/forestry/fra/fra2010/en/)

References Cited

[1] UNFCCC. (2009) *Energy efficiency measures in thermal applications of non-renewable biomass*. Methodological guideline. Series: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories (II.G./Version 03). UNFCCC. Copenhagen, Denmark. 5 pp. Available from: http://cdm.unfccc.int/methodologies/DB/HVLUZ94B86UAM25MUWSLT2O98PBVAR

[2] Mulombwa, J. (1998) *Woodfuel review and assessment in Zambia.* Technical report. Series: Forestry Statistics and Data Collection (AFDCA/WE/22). Food and Agriculture Organisation of the United Nations. Addis Ababa, Ethiopia. 55 pp. Available from: http://www.fao.org/docrep/004/X6802E/X6802E00.htm

[3] Central Statistical Office. (2011) *2010 Census of Population and Housing Preliminary Report*. Government of Zambia. Lusaka, Zambia. Available from: http://unstats.un.org/unsd/demographic/sources/census/2010_PHC/Zambia/PreliminaryReport.pdf

[4] Bailis, R.E. (2005) Fuel from the Savanna: the Social and Environmental Implications of the Charcoal Trade in Sub-Saharan Africa. PhD Thesis.University of California. Berkeley, CA. Available from: http://rael.berkeley.edu/sites/default/files/old-site-files/diss/Robert_Bailis_2005.pdf

[5] RWE. (2009) *CDM Lusaka Sustainable Energy Project 1, Version 2.0*. Clean Development Mechanism Project Design Document (CDM-SSC-PDD). RWE Power AG/Climate InterChange AG. 80 pp. Available from: http://www.rwe.com/web/cms/mediablob/en/359282/data/346364/5/rwe-power-ag/innovations/cdm-ji/CDM-SUSTAINABLE-ENERGY-PROJECT-LUSAKA-ZAMBIA.pdf

[6] FAO. (2007) *State of the World's Forests 2007*. Food and Agriculture Organisation of the United Nations. Rome, Italy. Available from: http://www.fao.org/docrep/009/a0773e/a0773e00.HTM

[7] Mukosha, J.M. (2010) *Global Forest Resources Assessment 2010: Country Report Zambia*. Country Report. Series: Global Forest Resources Assessment (FRA2010/233). Forestry Department, Food and Agriculture Organisation of the United Nations. Rome, Italy. 45 pp. Available from: http://www.fao.org/docrep/014/am326e/am326e.pdf

[8] Gondo, P.C. (2010) *Financing of Sustainable Forest Management in Africa: An overview of the current situation and experiences.* United Nations Forestry Forum Discussion Paper. Southern Alliance for Indigenous Resources (SAFIRE). Harare, Zimbabwe. 103 pp. Available from: http://www.un.org/esa/forests/pdf/aheg/aheg1/Africa_case_study.pdf

[9] Namugala, C. (Hon). (2009) *Ministerial statement on the removal of illegal settlers from the prime wildlife areas of Sichifulo Game Management Area.* Parliamentary address. Zambian Ministry of Tourism, Environment and Natural Resources. Lusaka. 6 pp. Available from: http://www.parliament.gov.zm/index.php?option=com_docman&task=doc_view&gid=399

[10] Bwalya, S.M. (2004) *Rural Livelihoods and Collective action in Joint Forest Management in Zambia*. Series: SAGA Competitive Grants Program Final Report. Clark Atlanta University. Georgia, USA. 44 pp. Available from: http://www.saga.cornell.edu/images/cau-bwalya.pdf

[11] Kalinda, Bwalya, Mulolwa & Haantuba (2008) USE OF INTEGRATED LAND USE ASSESSMENT (ILUA) DATA FOR ENVIRONMENTAL AND AGRICULTURAL POLICY REVIEW AND ANALYSIS IN ZAMBIA, December 2008, page 43 Available from: http://www.fao.org/forestry/16955-0c90798cee1e59a8542ede210a9834227.pdf

[12] UNDP. (2010) *UN Collaborative programme on reducing emissions from deforestation and forest degradation indeveloping countries: National Joint Programme Document*. (UN-REDD/PB4/4ci/ENG). FAO, UNDP and UNEP. New York, NY. 126 pp. Available from: http://www.unredd.net/index.php?option=com_docman&task=doc_download&gid=1527%Itemid=53

[13] World Agroforestry Centre. (2008) Wood Density Database. Available from: http://www.worldagroforestry.org/sea/Products/AFDbases/WD/Index.htm
Links to species:
Sterculia sp:
http://www.worldagroforestrycentre.org/sea/Products/AFDbases/WD/asps/DisplayDetail.asp?SpecID=3272
Diospyros:
http://www.worldagroforestrycentre.org/sea/Products/AFDbases/WD/asps/DisplayDetail.asp?SpecID=1134

[14] Chidumayo, E.M. (2009) Determining the Non-Renewable Portion of Biomass Utilized in Charcoal Production for Lusaka. Available from: http://cdm.unfccc.int/filestorage/6/5/G/65G9VAZKYPMJO2TUQBXW38D7LFEN01/Enclosure.pdf?t=TnZ8MTMwNzQ0NjE4OS4yMw==|rvzBarPcd17se-wwFNWQC6wBnNM=

[15] Mulombwa J. 1998. Woodfuel review and assessment in Zambia. Data Collection and Analysis for Sustainable Forest Management in ACP Countries - Linking National and International Efforts. EC-FAO Partnership Programme (1998-2002). Available at http://www.fao.org/docrep/004/X6802E/X6802E04.htm#835 .

[16] Kamelarczyk, K.B.F. (2009) *Carbon stock assessment and modelling in Zambia, a UN-REDD Programme study.* MRV Working Paper. Series: UN-REDD Programme (4). FAO, UNDP and UNEP. 89 pp. Available from: http://europeandcis.undp.org/poverty/show/598286B5-F203-1EE9-B2D4FA8BCBD14CE6

[17] Chileshe, A. (2001) Forestry Outlook Studies in Africa: Zambia. Series: Forestry Resources Outlook for Africa (FOSA). FAO; Forestry Department, Ministry of Environment and Natural Resources. Rome, Italy. 29 pp. Available from: ftp://ftp.fao.org/docrep/fao/004/AC428E/AC428E00.pdf

[18] Monica Garzuglia and Mohamed Saket (FAO, 2003) Wood volume and woody biomass: Review of FRA 2000 estimates.

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In reply please quote
ECZ/INS/101/4/1
No. .....

March 16, 2011

The Programme Coordinator
Africa Carbon Credit Exchange (ACCE)
4th Floor, Godfrey House
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P.O. Box 390035
Lusaka, Zambia

Dear Madam,

ENERGY EFFICIENT STOVE PROJECT (ZAMBIA)

Reference is made to your e-mail of 15th September 2010 in which you requested for environmental clearance to allow the Africa Carbon Credit Exchange, in cooperation with ICECAP (a UK-based carbon project developer), to prepare and submit a PDD for a carbon offset project that will involve the distribution of high-efficiency wood fuel cookstoves to rural households in Zambia.

With reference to the information provided by yourselves in the Project Idea Note, ECZ has no objection to the proposed project and therefore there is no need for an environmental impact assessment to be carried out. This is because the negative impacts associated with the project are insignificant while the positive environmental impacts to be enhanced are considerable.

This is in line with the Environmental Impact Assessment Regulations, Statutory Instrument No. 28 of 1997 where ECZ draws powers to identify which projects require environmental assessment.

All correspondence to be addressed to the Director - Head Office

Do not hesitate to contact the undersigned should there be any issues herein that you would wish to clarify.

Yours faithfully,

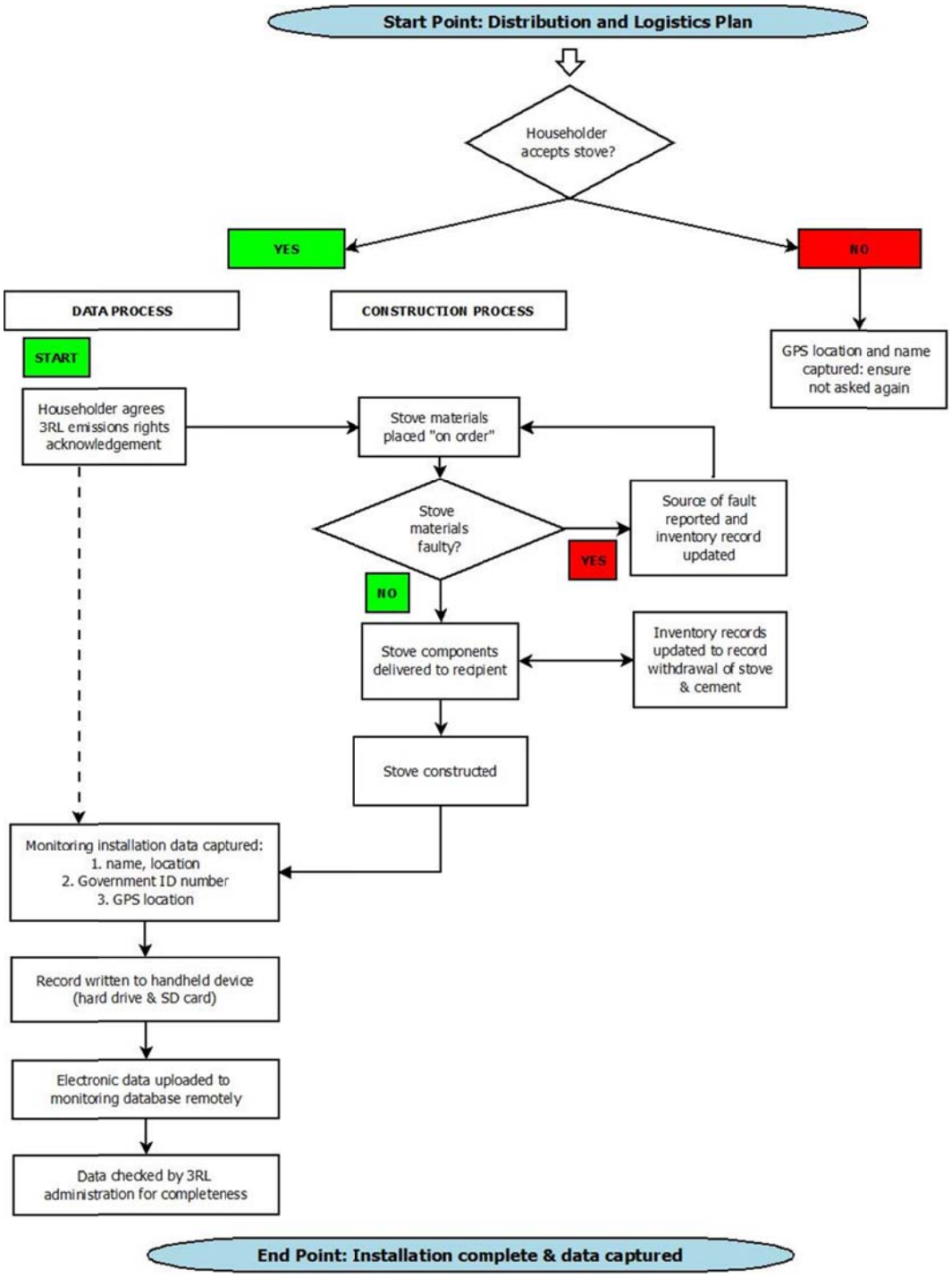
Maxwell Nkoya
Acting Manager - Inspectorate
For/Director
ENVIRONMENTAL COUNCIL OF ZAMBIA

Annex 4

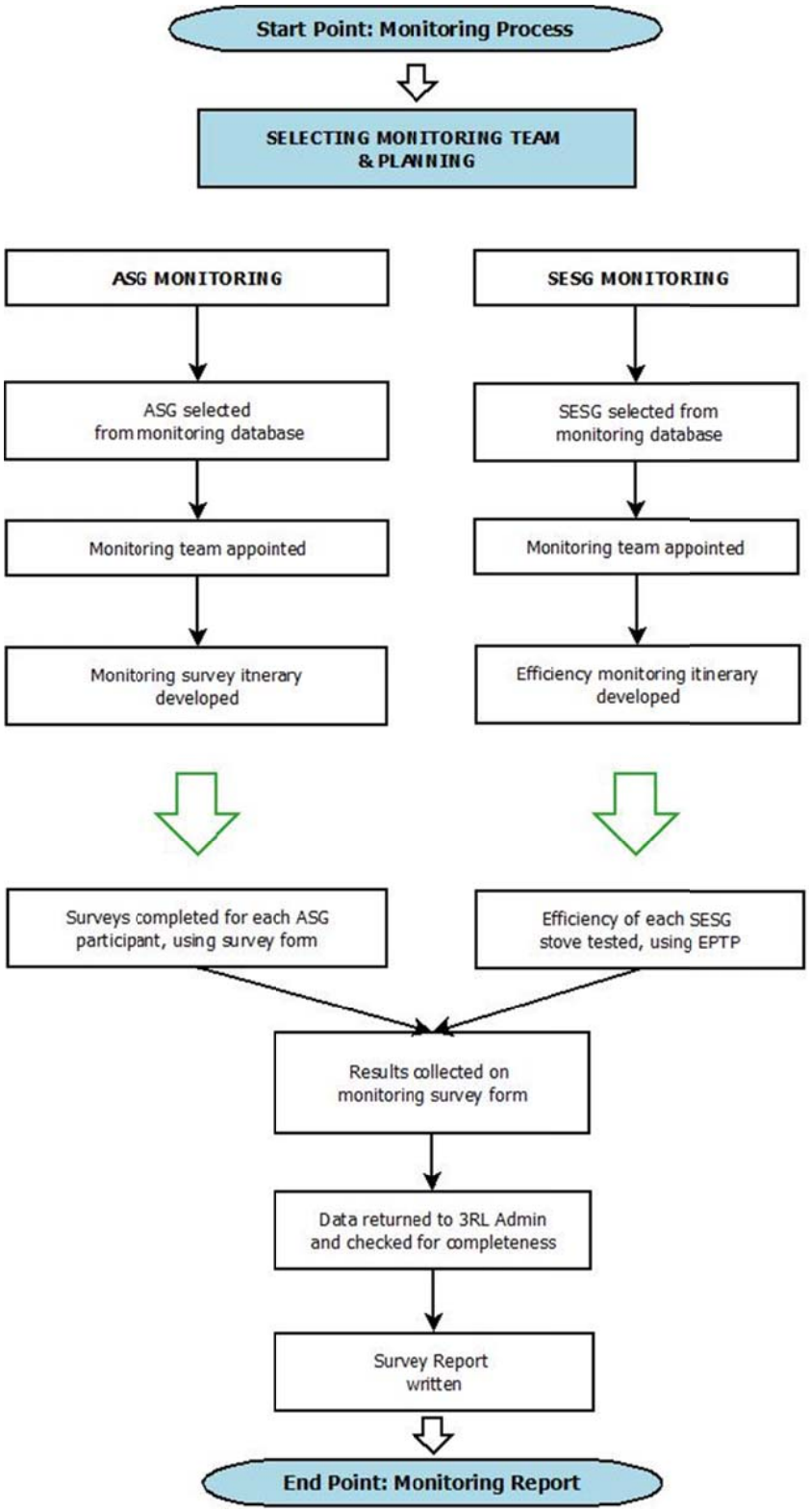
MONITORING INFORMATION

- - - - -

A. Installation Process



B. Monitoring Process



C. Organizational Chart / Monitoring Structure