



Monitoring report form
(Version 04.0)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT

Title of the project activity	Efficient Fuel Wood Cooking Stoves Project in Foothills and Plains of Central Region of Nepal
Reference number of the project activity	4530
Version number of the monitoring report	1
Completion date of the monitoring report	20/10/2014
Registration date of the project activity	15/03/2011 (Date of registration action 06/06/2011)
Monitoring period number and duration of this monitoring period	Monitoring period number: 1 Duration of this monitoring period: 01/05/2011–30/04/2014.
Project participant(s)	Centre for Rural Technology, Nepal – Host country Egluro – Annex I country
Host Party(ies)	NEPAL
Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)	Sectoral scope: 3 : Energy demand Applied methodology: AMS-II.G ver.2 – Energy efficiency measures in thermal applications on non-renewable biomass
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	72,162 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	40,970 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	12,871 tCO ₂ e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	28,099 tCO ₂ e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The purpose of the proposed project is to reduce fuel consumption by introducing fuel efficient cooking stoves in six Terai districts namely: Parsa, Bara, Rautahat, Sarlahi, Mahottari, and Dhanusa of Central Development Region of Nepal. It is expected that the project will contribute towards checking deforestation and degradation of forests in the Terai region through wider and voluntary participation of the people in adopting fuel efficient stoves. This will also contribute to improvement in quality of lives of the targeted people through reduction of drudgery, time and money spent on fuel wood collection and through improvement of indoor environment. Globally, the project will contribute by reducing emission of GHG in the atmosphere.

The project activity has disseminated basically two models of fuel efficient cooking stoves. The first one is the built-on-site model mud stove and the second one is prefabricated metal rocket stove.

(i) Built-on-site model: This is the two pot hole mud-brick stove with chimney which is built on site inside the kitchen of the user household. The choice of the type and size (dimension) of stove depends on the use and family size of the house. The model to be promoted is the improved version of the similar model being promoted in the mid-hill areas by the Biomass Energy component of Energy Sector Assistance Programme under the Alternative Energy Promotion Centre and other projects. The improvement in this model is addition of better insulation and heat retaining device in the combustion chamber, decreased mass of the stove and reduced chimney height. The improvement provides better heat transfer to the cooking pots and reduces overall cooking time. The improvement also provides consistency in design and dimension. The efficiency of these stoves is 30.65-33.46% and fuel saving 30-50%, compared to the existing traditional stoves in use. The two pot hole model provides two items of cooking at a time and reduces overall cooking time.

The ranges of dimensions of the ICS are given in the table below.

Type	Φ 1 st PH	Φ 2 nd PH	Dimension range in inches				
			Length	Breadth	Height	Fire gate	Chimney
2 PH raised ICS	8-10	6-8	25-31	14-18	10-12	6-8	20-24
2 PH plain ICS	8-10	6-8	25-31	14-18	10-12	6-8	20-24

There is some demand for 1 and 3 pothole stoves but significant demand is not expected. The experiences from the national ICS programme of AEPC and Chitawan ICS Carbon Project show that users in general prefer 2 pothole stoves. Nonetheless, in order to maximize benefits of the project, technical support will be extended to construct 1 and 3 pothole stoves but there will be no financial support for them, and hence they will not be taken into account in calculating emission reductions.

(ii) Prefabricated model: The project also promote few pre-fabricated model, a modified version of mud/metal rocket stove to suit the local cooking practices, needs and preferences of different ethnic groups and communities in the project districts. The efficiency of these portable stoves is 28.72-30.43% and emits less smoke as compared to the traditional stoves.

Both these stoves models serve all the requirements like cooking, heating, frying, baking bread and boiling water as in the traditional stoves. These stoves have been improved recently by CRT/N to meet the requirements of the people living in the Terai region of Nepal. If well maintained the life of the stove is 3-5 years. However, to avoid any reduction in efficiency, the users will replace the stoves with new ones after using for 3 years and will be recorded and monitored by the project staffs.

A fuel efficient stove saves fuel wood in the range of 30-50% as compared to the traditional stoves and hence reduces the greenhouse gas emissions through the reduced amount of fuel wood use from the non renewable biomass.

A.2. Location of project activity

Host Party: NEPAL

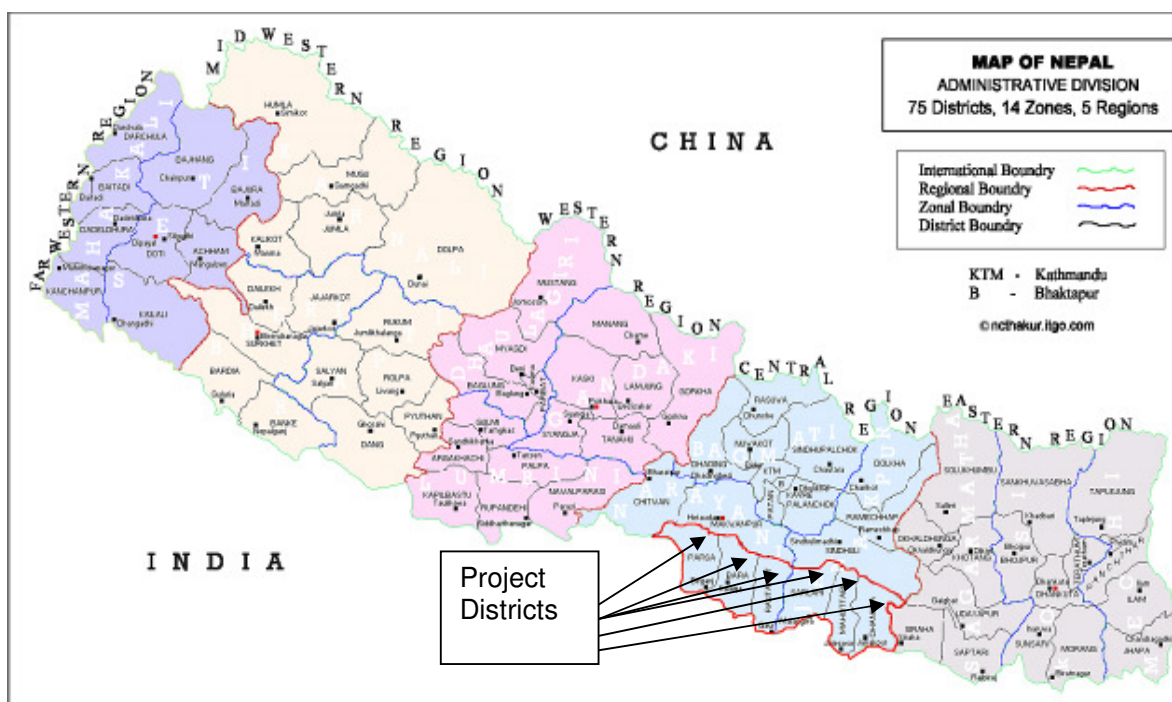
Project Location: The project is located in the foothills and plain areas in the Central Development Region of Nepal. The project area includes six districts, namely: Bara, Parsa, Rautahat, Sarlahi, Mahottari and Dhanusa lying within 26038'00"-27030'00" north latitude and 84022'00"-86014'00" east longitude.

City/Town/Community: The project has been implemented in 120 Village Development Committees (VDCs) 7 of the six districts mentioned above. This includes rural communities as well as semi urban areas in the VDCs.

The project is located in central region of Nepal and the districts included are: Parsa, Bara, Rautahat, Sarlahi, Mahottari and Dhanusha.

The project communities are located within 20 Village Development Committees (VDCs) of each of the mentioned districts. Generally, the project VDCs are located in the northern part of the districts along the east-west highway.

Physical/Geographic Location:



A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A NEPAL (host)	Private entity A Centre for Rural Technology, Nepal	No
Party B (UNITED KINGDOM)	Private entity B Egluro Limited (Project Investor)	No
...	...	

A.4. Reference of applied methodology and standardized baseline

Sectoral scope: 3 : Energy demand

Type II – Energy efficiency improvement projects

Applied methodology: AMS-II.G ver.2 – Energy efficiency measures in thermal applications on non-renewable biomass

Tools: UNFCCC Additionality Tool (Version 05.2, EB 39)

Standardized Baseline: Refer to the UNFCCC CDM website

A.5. Crediting period of project activity

Type of crediting period: Fixed crediting period

Start date of the crediting period: 01/05/2011

Length of crediting period corresponding to this monitoring period: 10 years

A.6. Contact information of responsible persons/ entities

Organization:	Centre for Rural Technology, Nepal
Street/P.O.Box:	P.O.Box 3628
Building:	N/A
City:	Lalitpur
State/Region:	Kathmandu
Postfix/ZIP:	N/A
Country:	Nepal
Telephone:	+977 1 5547627
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E-Mail:	info@crtnepal.org
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Represented by:	Ganesh Ram Shrestha
Title:	Executive Director
Salutation:	Mr.
Last Name:	Shrestha
Middle Name:	Ram
First Name:	Ganesh
Department:	Centre for Rural Technology, Nepal
Mobile:	N/A

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Organization:	Egluro.
Street/P.O.Box:	16 Gews Corner
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State/Region:	Hertfordshire
Postfix/ZIP:	EN8 9BX
Country:	UK
Telephone:	+44 7977 58257
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URL:	N/A
Represented by:	Kieron Robinson
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Salutation:	Mr.
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Middle Name:	Hugh
First Name:	Kieron
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Personal E-Mail:	khrttf@fsmail.net

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

The project activity involves fabrication of ceramic combustion chambers by local potters and fabrication of mud bricks and installation of stoves at the user households by promoters.

The project activity began from October 2010 but the stoves were installed/sold from March 2011 and the ER calculation started only after the registration date 15/03/2011.

Till 30/04/2014, a total of 14,872stoves have been installed. The month-wise installation of stoves is as given below.

Month	Number of households having installed the stoves
Apr-11	357
May-11	407
June-11	428
Jul-11	326
Aug-11	372
Sep-11	384
Oct-11	446
Nov-11	707
Dec-11	774
Jan-12	414
Feb-12	526

Mar-12	549
Apr-12	629
May-12	1151
June-12	792
Jul-12	275
Aug-12	467
Sep-12	1188
Oct-12	1581
Nov-12	1237
Dec-12	1361
Jan-13	431
Feb-13	0
Mar-13	13
April-13	5
May-13	6
June-13	46
Total	14,872

The project activities have been implemented in 112 Village Development Committees in the six project districts by 30 April 2014.

It has been reported that all the stoves installed so far are in continued operation.

As per PDD, once the stoves implemented by the project are installed, the users are expected to dismantle the old traditional stoves. As of 30 April 2014, a total of 12,418 households who have installed new stoves have dismantled their old stoves. Some of the households have kept the old stoves intact but they do not use it. They keep it to use these old stoves in some special social and religious occasions. This implies all the installed stoves are in operation.

As per the PDD, the project can promote two types of stoves. They are:

(i) Built-on-site model: This is the two pot hole mud-brick stove with chimney which is built on site inside the kitchen of the user household. The choice of the type and size (dimension) of stove depends on the use and family size of the house; and

(ii) Prefabricated model: This is a modified version of mud/metal rocket stove to suit the local cooking practices, needs and preferences of different ethnic groups and communities in the project districts.

During the monitoring period (01/05/2011 – 30/04/2014), the project has promoted mainly the built-on-site model and only 38 pre-fabricated model.

During the monitoring period (01/05/2011 – 30/04/2014), the total GHG emission reductions achieved is 40,971.10 tCO₂e which also accounts leakage.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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The project has applied temporary deviation in the frequency of measurement of Carbon Monoxide (CO) and fine particulate matter (PM_{2.5}) emission from burning the fuel wood in fuel efficient stoves. The emission measurement has taken place only once in the year instead of two times as mentioned in the PDD.

The main reason for this temporary deviation is unavailability of measuring equipment with the proponent or in the market in Nepal. Besides there are very limited trained people to carry out efficiency and emission tests.

B.2.2. Corrections

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With this monitoring report, the project proponent requests for permanent deviation with respect to frequency and measurement methods of measuring Carbon Monoxide (CO) and fine particulate matter (PM_{2.5}) emission from burning the fuel wood in fuel efficient stoves.

In section B.7.1 of the registered PDD, "Stove Emissions (CO and PM_{2.5})" has been considered as monitoring parameter which should be monitored two times a year using standard instruments like UCB PM Monitor and Hobo CO monitor or the equivalent instrument available following the standard guidelines from the manufacturers. The users' perception regarding stove emissions and changes in indoor air pollution can be captured during annual users' survey. Therefore, the parameter should be monitored once a year along with the users' perception survey through questionnaire.

The Project proponent has filled in the PRC request form and submitted to the verifier for necessary approval from UNFCCC for deviations.

B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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No permanent changes in the monitoring plan or applied methodologies have been made.

B.2.4. Changes to project design of registered project activity

No changes in project activity is proposed.

B.2.5. Changes to start date of crediting period

No change in start date of crediting period is proposed.

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable

SECTION C. Description of monitoring system

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The purpose of the monitoring plan is to ensure successful monitoring of the emission reductions of the proposed project during its crediting period. The overall monitoring is managed by the project implementer Centre for Rural Technology, Nepal (CRT/N).

The project implementation started in October 2010 after setting up of the Project Team and after the validation process. The Project Team identified local partner organisations (LPOs) and involved them in social mobilization. Together with the LPOs, the Technical Officer (TO) identified and trained stove builders (promoters) for the fixed type of stove. In the mean time, the TO together with LPOs identified manufacturer and retailers for the portable stove. Thus stove dissemination kicked off after the training of promoters and identification of fabricators of portable stoves. The trained promoters then installed the fuel efficient stoves in individual households in the project area based on demand from the users. Portable stoves are fabricated in the local workshops. The local workshops were initially trained by the project team for quality assurance of the product.

Demand for stoves is created through vigorous awareness, publicity campaign, promotion and marketing, orientation and demonstration through the existing local network of community based organizations and the network of promoters.

The monitoring which is a continuous inbuilt process in the project has monitoring plan implemented in full fledges after the stoves started to be disseminated in the project area. The Project Manager acts as a field CDM monitoring officer.

Stove installations

The information on installation of fixed type stoves is first reported by the promoters in monthly meeting at field level. The promoters use installation data format and is substantiated by ER transfer slip signed by the users.

The LPO staff and Technical Officer verify the data and compile monthly installation data which is passed on to the Project Manager.

Computer data entry of all the fuel efficient stove installed/sold is made on monthly basis by the Project Manager. Besides, all monitored data and information are stored both on paper and electronically by the Project Manager. A copy of the papers and the electronic database is sent to CRT/N central office in Kathmandu every month.

Confirm dismantling of old stoves

Fuel efficient stoves are installed/sold only when the existing traditional stoves are dismantled. Dismantling/scraping of old stoves is monitored and photographs taken with user name and stove ID captioned. The dismantling and scraping is also reflected in the Emission Reduction Transfer Slip (an agreement between household owner and CRT/N confirming stove installation and ER transfer). This will be spot checked during the monitoring visits by the project team. The physical spot check by the district-based project staff and LPO staff (50%), by the Project Manager (10%) and by the CRT/N central staff (5%) will make sure that the old stoves have been dismantled and not in use. Moreover, the LPO staff will be in regular contact/communication to ensure regular use of new stoves. The LPO staffs will spot check the user households of portable stoves immediately as they are reported to have purchased the stoves. The old fixed type stoves are dismantled and old portable type stoves are collected and destroyed periodically. All the data and information of the stoves dismantled/scrapped will be recorded in the spreadsheet to ensure stoves are dismantled properly and replaced by new stove. In addition, sample survey by a third party will also verify non-use of old stoves. During this verification the number of stoves dismantled/scrapped shall be verified through monthly installation reports archived both in electronic and hard copy versions. The database of installation/sales also contains information on number and type of old stoves dismantled/scrapped. The stoves that replace the old stoves are the fuel efficient stoves which are disseminated under the project. This is verifiable as each new fuel efficient stove will have a

unique 10-digit identification number tag which identifies district, VDC, promoter/retailer, and the user. The coding scheme is as below:

District	VDC	Promoter/Retailer	User Serial
1 to 6	01 to 20	001 to ...	0001 to ...

District code (single digit) ranges from 1 to 6. VDC code (two digits) in each district will range from 01 to 20. Promoter/retailer code (three digits) in each district begins from 001 and may reach up to 999. Users served by each promoter/retailer are assigned four digit number starting from 0001. A combination of all such components will generate a unique 10 digit code for each stove as shown in the sample code below:

District	VDC	Promoter/Retailer	User Serial
1	02	001	0015

The unique code is thus 1020010015. The letter 'F' and 'P' will be added at the end of the code to distinguish between fixed type or portable type stove. The same unique ID code number is maintained for the same user after replacement with the dismantling of the stove. There might be some cases where the users have migrated out of the village, in such case the new user provided with a new stove and same stove ID code of the previous stove user will be applied so that the total number of stoves will remain the same. Further, there may be some users not willing to install new stoves will be removed from the user data base and their stove ID will be used for new users.

Sample size and determination of sample households

As under the CDM only emission reductions that are monitored and verified can be claimed, therefore, the independent survey applying systematic sampling process will be carried out before each verification (See sampling plan Annex 3F and monitoring information Annex 4). This will incorporate monitoring parameters like the survey for sample households to cross check the performance of stoves installed, percentage of stoves in use, measurement for CO and PM_{2.5}, percentage of stoves in use. The survey will also ensure that stoves are all operating at the specified efficiency and where replacements are made the efficiency of the replaced stoves is similar to the stove being replaced.

With the estimated total number of households of 22920 having fuel efficient stoves and every household shall have one stove only (either fixed type or portable type stove); the statistically appropriate sample required for survey will be 68 for the confidence level of 90% and a confidence interval of +/-10%. Since variance of the parameter is not known a priori, the preferred formula is that used for estimating sample size for proportions given below:

$$n = \frac{Z^2 pq}{e^2}$$

where,

n ~ sample size

Z ~ is the corresponding abscissa of the normal curve for 90% confidence level (1.645)

p and q ~ estimated proportion of attribute, conservative value of 0.5, 0.5 has been taken.

e ~ desired level of precision, 10%

The sample size may differ for the survey conducted later on as variance value from the first survey could be used to estimate sample size. Please refer Sampling Plan Documentation Annex 3F. The monitoring data and information is archived for at least 2 years after the end of actual crediting period or the last issuance of CERs for the project activity whichever comes later.

The sample survey is conducted once a year. The sample households will be selected following systematic sampling approach. The stove user households will be arranged by corresponding LPOs then by year of installation then by promoter. This will ensure selection of user households served by all LPOs, possibly all promoters and having stoves of different age.

Efficiency tests, equipments and measurements

The efficiency test of stoves is done every year to determine mean efficiency of the stoves in use. Technical testing is done following stove testing protocol developed by University of California, Berkeley and The Shell Foundation. Only the digital thermometer and digital weighing machine will be used to take the measurements. These equipments are calibrated by the manufacturer. If the equipments in use require maintenance/calibration they will be replaced by new similar equipments.

Likewise in order to determine mean emission level during winter and summer seasons, measurement of stove emissions (CO and PM_{2.5}) will be taken on six monthly basis. Measurement will be taken using HOBO and UCB Particle Monitor or the equivalent instrument available following standard guidelines of the manufacturer. These equipments are calibrated by the manufacturer. If equipments need calibration, they will be sent to the manufacturer. Since the calibrated HOBO and UCB Particle Monitor or the equivalent instrument was not available the emission measurement was carried out on annual basis only when the instruments were available. The earlier tests performed by Energy Sector Assistance Programme has reported that there is negligible seasonal variation.

Quality Assurance

CRT/N central office cross checks the database through its Carbon Analyst and Technical Expert to ensure compliance with the CDM project monitoring plan. The central office team will visit the project area on quarterly basis to have random spot checks of 5% of stoves in the database entry. The Project Manager makes spot checks of 10% of the stoves and will take appropriate corrective actions for any inconsistencies. Altogether 50% of the efficient stove installed/sold is spot-checked by the project and partner staff including promoter to ensure the quality and if required necessary corrective measures are taken during the visit. The spot check by LPOs/TO will also see whether the dismantled/scrapped stoves are being used outside the project area. At the end of every month, the TO sends the physical progress of stove installation/ sales or replacement to the Project Manager along with the users' ER transfer slip.

CRT/N central office employs independent third party for sample survey as part of the monitoring plan. The activities of independent third party include:

- Identification of the households that are randomly selected based on the sampling plan.
- Ex-post collection of data on Fuel efficient stoves disseminated, fuel efficient stove replaced biomass use in project area and outside the project area, stoves in operation and use and the efficiency of stove.¹

CRT/N produces quarterly report and annual monitoring report and submits to Egluro. Egluro assists CRT/N in implementation and monitoring of the project and coordinates with Designated Operational Entity (DOE) and the UNFCCC.

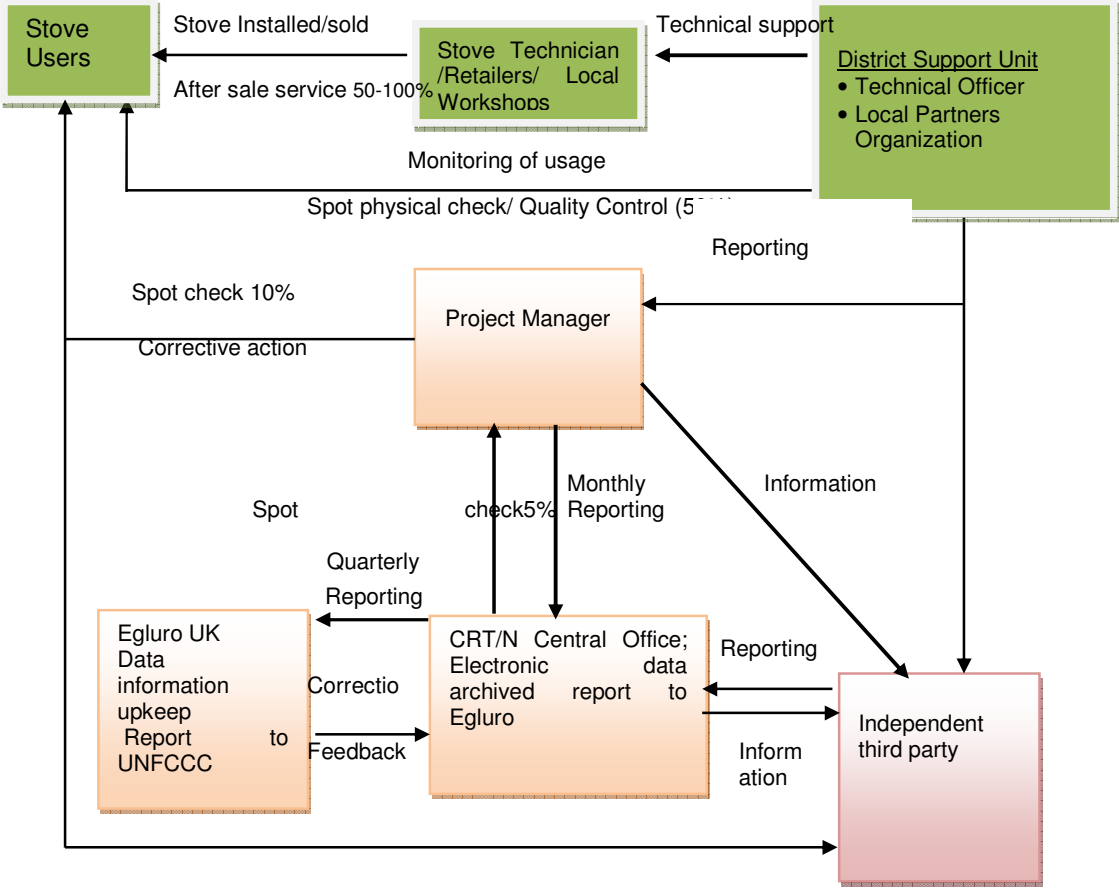
Data archiving

All data monitored and required for verification and issuance will be stored for 2 years after the end of the actual crediting period or the last issuance of CERs for the project activity, whichever comes later.

The organization of the project monitoring is as follows:

¹ Please refer Annex 3G for sampling plan

Fig: IV



Sample survey and stove test for stove /biomass usage and check for leakage

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

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

Data / Parameter:	B_y
Unit:	Tonnes/year

Description:	Quantity of woody biomass used in the absence of project activity per household (in tonnes)
Source of data:	Baseline Survey Final Report,, October 2009 (See Annex 3A, 3B of PDD) The sample size of 477 households(n) was determined on the basis of 90/10 precision along with the margin of error 5% and the formulae used was $n = Z^2 \times S^2 / d^2$ where n is sample size, s is standard deviation, z is corresponding abscissa of the normal curve for 90% confidence level and d is margin of error. The values for s and d were taken from the baseline survey conducted by Winrock International for Chitawan ICS Carbon project. The total number of households in the 6 project districts covering a total of 120 VDCs is 188291.
Value(s) applied:	2.7 tonnes/year
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	The quantity of biomass used per month will be obtained by dividing the biomass used per year by 12.

Data / Parameter:	η_{old}
Unit:	Fraction
Description:	Efficiency of the system being replaced
Source of data:	1) UNFCCC default value from Methodology II.G/ Version 02 'Energy Efficiency Measures in Thermal Application of Non-Renewable Biomass, EB 51 Annex 04 December 2009.
Value(s) applied:	0.10
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	2) Douglas F. Barnes, Kirk R. Smith et al (1994), What Makes People Cook with Improved Biomass Stoves, World Bank Technical Paper No 242. http://ehs.sph.berkeley.edu/krsmith/publications/94_barnes_1.pdf (p.4) 3) K.M Sulpiya, "Stoves used for cooking, water heating and space heating in Nepal used in Nepal, Boiling Point Issue 38 (1997). The efficiency of the traditional stove measured from the water boiling and cooking test conducted in Jumla was reported as 8.9% http://www.hedon.info/StovesUsedForCookingWaterHeatingAndSpaceHeatingAtHighAltitudeInNepal (efficiency table)

Data / Parameter:	η_{new}
Unit:	Fraction
Description:	Efficiency of the system being deployed as part of the project activity
Source of data:	Water Boiling Test carried out by professionals from Kathmandu University part of third party monitoring.
Value(s) applied:	0.2794
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	

Data / Parameter:	f_{NRB}
Unit:	Fraction
Description:	Fraction of non-renewable woody biomass saved by the project
Source of data:	<ul style="list-style-type: none"> Baseline Survey Final Report, October 2009 (See Annex 3A, 3B) Forest Cover Change Analysis of the Terai District (1990/91 - 2000/01), Department of Forest, May 2005, Table 1, p. 6 Forest Resources of Nepal (1987-1998) Master Plan for the Forestry Sector Nepal:
Value(s) applied:	0.807
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	Proposed project area is in the central region of Terai.

Data / Parameter:	$NCV_{biomass}$
Unit:	TJ/t
Description:	Net calorific value of non-renewable woody biomass that is substituted
Source of data:	IPCC default value for fuel wood
Value(s) applied:	0.015 TJ/tonne
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	

Data / Parameter:	$EF_{\text{projected fossil fuel}}$
Unit:	t CO ₂ /TJ
Description:	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data:	IPCC default value for Kerosene
Value(s) applied:	71.5 t CO ₂ /TJ
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	

Data / Parameter:	L_y
Unit:	Fraction
Description:	Leakage Discount Factor
Source of data:	Taken from assessment of leakage

Value(s) applied:	5%
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	

D.2. Data and parameters monitored

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

Data / Parameter:	V_n
Unit:	Number
Description:	Project villages/ village development committee (VDC)
Measured/ Calculated / Default:	Measured
Source of data:	VDCs mentioned in the users data form
Value(s) of monitored parameter:	112 VDCs have been covered by project activities as of 30/04/2014
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	VDC wise fuel efficient stove installation/sales data has been maintained.
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	The number of VDCs where fuel efficient stoves to be disseminated will be up to 20 in each district.

Data / Parameter:	D_n
Unit:	Number and type
Description:	Type of stove displaced/dismantled
Measured/ Calculated / Default:	Measured
Source of data:	Monthly efficient stove installation/sales data reported by the promoter and LPO through technical officer and Project Manager.
Value(s) of monitored parameter:	12,418 old stoves have been dismantled as of 30/04/2014
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Not applicable
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The data will be randomly checked by independent third party consultant during annual sample survey as part of monitoring.
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	None

Data / Parameter:	N_y
Unit:	Number
Description:	Total number of efficient operational stoves.
Measured/ Calculated / Default:	Measured
Source of data:	Monthly efficient stove installation/sales data reported by the promoter and LPO through technical officer and Project Manager.
Value(s) of monitored parameter:	14,872 efficient stoves have been installed as of 30/04/2014
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Computer data entry of the fuel efficient stove installed/sold is made on monthly basis by the Project Manager. A copy of the stove installation/sale is sent to CRT/N central office in Kathmandu every month which is cross checked by the carbon analyst and technical expert. The central office team will visit the project area on quarterly basis to have random spot checks of 5% of stoves in the database entry. The Project Manager makes spot checks of 10% of the stoves and will take appropriate corrective actions for any inconsistencies. Altogether 50% of the efficient stove installed/sold is spot-checked by the project and partner staff including promoters to ensure the quality and if required necessary corrective measures are taken during the visit.
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	The serial number of stove will be marked on each of the stove installed/ sold.

Data / Parameter:	η_{new}
Unit:	% heat utilized
Description:	Efficiency of the Fuel Efficient appliance replaced
Measured/ Calculated / Default:	Measured
Source of data:	Water Boiling Test for each year of operational stove (see KU report)
Value(s) of monitored parameter:	0.2794
Monitoring equipment:	
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The test will be carried out once a year by national experts in stove testing as an integral part of the sample survey to be conducted by the independent third party (external consultant) every year as per monitoring plan. Results from the test (ex post monitored value) will be compared to the values adopted for baseline emission calculations and the conservative value shall be considered for ex post emission reduction calculation.

Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	The ex post monitored value of efficiency has been used for ex post emission reduction calculation.

Data / Parameter:	Stove Emissions (CO and PM _{2.5})
Unit:	ppm and µg/m ³
Description:	Carbon Monoxide (CO) and fine particulate matter (PM _{2.5}) emission from burning the fuel wood in fuel efficient stoves.
Measured/ Calculated / Default:	Measured
Source of data:	Field measurement of the emissions for existing traditional stoves and Fuel efficient stoves by project team (see APTEC report)
Value(s) of monitored parameter:	CO – 7.66 ppm PM _{2.5} – 692.9 µg/m ³
Monitoring equipment:	
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The measurement has been taken by using standard instruments used to measure indoor air pollution in rural areas like IAP meter 5000 series manufactured by Approvecho Research Centre, USA.
Purpose of data:	As per AMS-II.G ver2, the data is directly used to estimate emission reductions for the project activity.
Additional comment:	None

Data / Parameter:	U _y
Unit:	%
Description:	Percent of user households who are continuously using the stoves. Those who used the stoves 3 or less months in a year will be discarded from further calculation of emission reductions.
Measured/ Calculated / Default:	Calculated
Source of data:	Sample survey (see APTEC Consultancy report 2014)
Value(s) of monitored parameter:	100%
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	
QA/QC procedures:	The survey done by third party consultant every year.
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	None

Data / Parameter:	t_y
Unit:	Months
Description:	Operation time of the fuel efficient stoves
Measured/ Calculated / Default:	Measured
Source of data:	CRT/N data base records; sample survey and APTEC Consultancy Pvt Ltd. Report July 2014
Value(s) of monitored parameter:	12
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The stove users' database entries are made in the Project Manager's office in the project area and the copy (paper and electronic) of the database is also maintained at CRT/N central office in Kathmandu on monthly basis. The database entries are shared with Egluro, UK on quarterly basis. CRT/N central office cross checks the database entries and take corrective measures for any errors. Egluro suggests on appropriate corrective measures if needed.
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	None

Data / Parameter:	L_y
Unit:	Tonnes/year
Description:	Quantity of woody biomass used by non user households (in tonnes)
Measured/ Calculated / Default:	Measured
Source of data:	Sample survey (APTEC Consultancy report)
Value(s) of monitored parameter:	2.590 Tonnes/year
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Qualified third party will be hired to conduct the survey independently.
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	None

Data / Parameter:	P_n
Unit:	Number
Description:	Number of local people (LPO staff, ICS promoters, rocket stove manufacturers, ceramic manufacturers) trained. The number can be segregated by gender. This parameter gives information on quantitative employment and income generation in the community.
Measured/ Calculated / Default:	Measured
Source of data:	Training reports which are generated after every training event
Value(s) of monitored parameter:	By 30/04/2014 following number of people have been trained on related topics: Promoters training: Female – 231, Male – 139, Total – 370 LPO staff training: Female – 1, Male – 7, Total - 8 Ceramic chamber fabrication training: Female – 1, Male – 17, Total – 18
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The ICS promoters trained were selected by local communities in close coordination with LPO/project staff and following a selection guideline.
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	None

Data / Parameter:	T_n
Unit:	Number
Description:	Number of technical training activities targeted to local people (LPO staff, ICS promoters, rocket stove manufacturers, ceramic manufacturers). This parameter gives information on quality of employment and technology transfer and technological self reliance.
Measured/ Calculated / Default:	Measured
Source of data:	Training reports which are generated after every training event
Value(s) of monitored parameter:	By 30/04/2014 following number of training events have been conducted on related topics: Promoters training: 25 LPO staff training: 1 Ceramic chamber fabrication training: 2
Monitoring equipment:	Ex post monitored value.
Measuring/ Reading/ Recording frequency:	Yearly

Calculation method (if applicable):	Not applicable
QA/QC procedures:	The training will be conducted following standard procedures and guidelines developed by CRT/N and other concerned agencies.
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	None

D.3. Implementation of sampling plan

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Sample size and determination of sample households

As under the CDM only emission reductions that are monitored and verified can be claimed, therefore, the independent survey applying systematic sampling process will be carried out before each verification (See sampling plan Annex3F and monitoring information Annex 4). This will incorporate monitoring parameters like the survey for sample households to cross check the performance of stoves installed, percentage of stoves in use, measurement for CO and PM_{2.5}, percentage of stoves in use. The survey will also ensure that stoves are all operating at the specified efficiency and where replacements are made the efficiency of the replaced stoves is similar to the stove being replaced.

With the total estimated number of households of 22920 having fuel efficient stoves and every household shall have one stove only (either fixed type or portable type stove); the statistically appropriate sample required for survey will be 68 for the confidence level of 90% and a confidence interval of +/-10%. Since variance of the parameter is not known a priori, the preferred formula is that used for estimating sample size for proportions given below:

$$n = \frac{Z^2 pq}{e^2}$$

where,

n ~ sample size

Z ~ is the corresponding abscissa of the normal curve for 90% confidence level (1.645)

p and q ~ estimated proportion of attribute, conservative value of 0.5, 0.5 has been taken.

e ~ desired level of precision, 10%

The sample size may differ for the survey conducted later on as variance value from the first survey could be used to estimate sample size. Please refer Sampling Plan Documentation Annex 3F. The monitoring data and information is archived for at least 2 years after the end of actual crediting period or the last issuance of CERs for the project activity whichever comes later.

The sample survey will be conducted once a year. The sample households will be selected following systematic sampling approach. The stove user households will be arranged by corresponding LPOs then by year of installation then by promoter. This will ensure selection of user households served by all LPOs, possibly all promoters and having stoves of different age.

SECTION E. Calculation of emission reductions or GHG removals by sinks

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

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As per the applied methodology, direct calculation of emission reductions as been made as below:

$$ER_m = B_{msavings,i} * f_{NRB} * NCV_{biomass} * EF_{projected\ fossil\ fuel} \quad (ii)$$

Where:

ER_y	Emission reductions during the year in t CO ₂ e
$ER_{m,i}$	Emission reductions in the following month after the efficient cooking systems are deployed, in tonne CO ₂ e
$B_{msavings,i}$	Quantity of woody biomass that is saved in tonnes per month
f_{NRB}	Fraction of woody biomass saved by the project activity, established as non renewable biomass using survey methods and government data source
$NCV_{biomass}$	Net calorific value of non-renewable woody biomass that is substituted (IPCC) default value for fuel wood 0,015 TJ/tonne, i.e. 15 MJ/kg wood)
$EF_{projected\ fossil\ fuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers

Biomass Savings:

$$B_{m\ savings,i} = B_y / 12 * (1 - \eta_{old} / \eta_{new})$$

Where:

B_y	Quantity of woody biomass used in the absence of the project activity (tonnes/year)
η_{old}	Efficiency of the system being replaced, measured using representative sampling methods and/or based on referenced literature values (fraction)
η_{new}	Efficiency of the system being deployed as part of the project activity (fraction)

Emission Reductions Calculations (tCO ₂)		
Activity Data	Value	Source of Data
By-Quantity of woody biomass used in the absence of the project activity (tonnes/year)	2.7	Registered PDD
f_{NRB}	0.807	Registered PDD
$NCV_{biomass}$	0.015	From AMS-II.G ver 2 methodology
$EF_{projected\ fossil\ fuel}$	71.5	From AMS-II.G ver 2 methodology
η_{new}	27.94%	Field study conducted by KU
η_{old}	10%	Registered PDD
ER _y (tCO ₂) for the monitoring period	40,970 tCO _e	Calculated based on the AMS-II.G ver 2 methodology

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

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There is no project emission reductions calculation as per the applied methodology. It is as per calculations made above under E.1.

E.3. Calculation of leakage

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As per the registered PDD, "a conservative value of 5% leakage has been applied to calculate emission reductions which is a fixed ex ante value that shall be deducted every year".

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO ₂ e)
Total	43,127	0	2,157	40,970

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO ₂ e)	72,162	40,970

E.6. Remarks on difference from estimated value in registered PDD

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Actual emission reductions achieved is less than estimated emission reductions shown in the PDD. The main reasons for this difference are:

The installation rate of stoves was slower than expected as it took time for communities to trust the new efficient stove. Particularly, the behavioural change that a new efficient stove calls for was not as anticipated.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO₂e)	12,871	28,099

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
04.0	25 June 2014	<p>Revisions to:</p> <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		