CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	•The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. •As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	•The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

>> **Efficient Fuel Wood Cooking Stoves Project in Foothills and Plains of Central Region of Nepal**
Version03 completed by Egluro, UK and Centre for Rural Technology, Nepal.
19/01/2011

A.2. Description of the small-scale project activity:

>> **The purpose of the project activity**

Increasing population, their dependence on fuel wood for energy, fodder to maintain a large number of livestock, timber for construction and other economic uses and the scarcity of agricultural land have together put heavy pressure on Nepal's forest resources and brought about widespread deforestation.[1] Fuel wood still represents 77 percent of energy needs of the country. The sustainable supply of fuel wood in 2000/01 was 6.5 million tonnes whereas the consumption for the same year was 15.4 million tonnes. This has led to a situation of environmental un-sustainability with the average annual rate of deforestation as 1.7%[2], considered to be high for the fragile hills ecosystem of Nepal[3]. The ministry of Forest and Soil Conservation study (MFSC 1994) found that almost 100,000 ha of forest had been lost from the Terai region between 1978 and 1991, equating to an annual rate of 1.3%. The National Forest Inventory (NFI, 1999) indicates that the total woody vegetation (forest and shrub) cover in Nepal has declined from 42.7 percent in 1978-79 to 39.6 percent in 1994[4] The Nepal Millennium Development Goals Progress Report 2005[5] has also indicated the decrease in forest coverage (p. 71) as 37% in 1999 and 29% in 2000 which is an indication of increased deforestation rates.

The purpose of the proposed project is to reduce fuel consumption by introducing fuel efficient cooking stoves in six Terai[6] 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.

---

1 FAO (1999)FRA2000-Forest resources of Nepal, country report, http://www.fao.org/docrep/005/ac612e/AC612E04.htm

2 FAO (1999) FRA2000-Forest resources of Nepal, country report, http://www.fao.org/docrep/007/ae154e/AE154E04.htm. The report mentions that the National Forest Inventory indicates that since 1978 forest cover has declined at a rate of 1.7 percent per annum.

3 Mope 2003. Nepal's state of the Environment (Rural Energy) Ministry of Population and Environment, Kathmandu

4 FAO (1999) FRA2000-Forest resources of Nepal, country report, http://www.fao.org/docrep/007/ae154e/AE154E04.htm. This report indicates that the national forest inventory (NFI) for 75 districts has been developed on the basis of Landsat TM satellite imagery for 14 Terai districts, aerial photo-interpretation information for 51 hill districts and inventory information for 10 districts.

5 Nepal Millennium Development Goals (MDG) Progress Report 2005,http://www.undp.org.np/publication/html/mdg2005/mdg2005.php

6 Plains in southern Nepal with elevation ranging from 100 to 500m above sea level.

Technology to be employed

The project activity will disseminate 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. Centre for Rural Technology, Nepal (CRT/N) has in the last two years disseminated about 1700 stoves of this model in one of the Terai district, Chitawan.

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

		Dimension range in inches					
Type	Φ 1st PH	Φ 2nd PH	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 will also promote a 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.

Out of total number of stoves to be disseminated under the project, the percentage mix of the fixed and portable stoves is not pre-determined. It depends upon actual demand made by the users.

Project measures

The project will be implemented with pre-investment from Egluro in return of future CERs. This funding would help to disseminate up to 22920 fuel efficient stoves in the project area in next 3 years through transfer of stove building skills and technology to the local people.

CRT/N in collaboration with local partner organisations (LPOs) implements the project activities. LPOs will be selected on the basis of criteria like past experience in energy project implementation, availability of competent human resource, outreach of services, etc. LPOs will be responsible for social mobilisation, communication and education for raising awareness, capacity building activities at local level, supporting the stove technicians, monitoring the project activities and coordinating activities with local stakeholders.

With social mobilisation support from LPOs, communities will select potential stove technicians (Promoters) for training. Priority will be given to women and people belonging to poorer sections. They will be trained in construction of built-on-site model stove and its repair and maintenance. The trained Promoters would then install the stoves in individual households in the project area based on demand from the users.

In case of prefabricated portable rocket stoves, potential fabricating workshops located in the project area will be identified. These workshops will be trained to fabricate the stove as per the drawing and specification. These workshops will sell the stoves to the users. The sales of portable stoves will take place through identified retailers. The promoters active in the area will provide a purchase slip to the potential buyer which the buyer must submit to the retailer to get the portable stove at subsidized rate. The retailer will submit the purchase slips along with sales record to concerned LPO to reimburse the subsidy amount. This will help the LPOs to keep the total sales record and users details on the portable stoves.

When the users demand for installations of improved stove either fixed or portable, the existing fixed type of stove will be dismantled and the existing portable stove will be taken by the promoter and will be destroyed (which will be a mandatory criteria for installing new improved stove) so as to prevent it from being used by other people in or out of the project area. A proof for the verification of dismantling of traditional stove will also be developed. The LPO staff and the promoter will monitor the installed stove continuously to ensure the stoves are in use.

A coding system has been developed to uniquely identify the stoves disseminated. Various parts of the 10 digit code identify 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 digit) 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. A sample code could be as 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 code number will be used for the same user after replacement of the stove.

The code number will be printed on the ER transfer slip signed by the user and the project staff. Some suitable tag will also be developed, which the user can stick/nail nearby the stove so that it is always visible.

Once the stove reaches 3 years lifetime it will be replaced by new stove and there will be no gap period. This electronic database on stove installations will help in identifying the stove that reaches 3 years. The 3-year old mud stove will be immediately replaced by the new one providing similar financial incentives as in the first time and rocket stove will be exchanged for the new one. The three-year old rocket stoves will be scrapped/destroyed after collection.

In order to support the field level project activities, CRT/N will set up a Project Team consisting of a Project Manager, Technical Officers and number of support staffs. The team will be assisted by Carbon Expert at the Carbon Finance Unit at CRT/N. Technical Officer will be responsible for smooth operation of the project activities in respective districts, technical support to LPOs and monitoring along with coordination with district line agencies.

The Project Manager is overall responsible for the implementation of the project activities. The Project Manager will maintain users' data collection on both paper and electronic version. The Project Manager will be based centrally at a suitable location in the project area.

The Project will facilitate formation of a District Advisory Committee (DAC) at district level. DAC will facilitate coordination among district based line agencies and also mobilise local resources. At VDC level, there will be Village Advisory Committee (VAC). VAC will facilitate coordination among community based stakeholders. The project will also benefit from a National Advisory Committee (NAC) comprising of representatives of various key institutions and experts. NAC will facilitate national level coordination and also provide some guidance to the Project Team.

Evidently, the promotion of the efficient stoves is demand based. As such, project activities will be geared towards creating the demand through vigorous awareness, publicity campaign, promotion and marketing, orientation and demonstration through the existing local network of community based organizations and the network of stove promoters.

The project has the provision of indirect subsidy to the users in the form of orientation on operation, repair and maintenance, after sale services of the trained stove Promoters as well as LPOs and project staffs. There is also direct subsidy for non local materials. In case of built-on-site model, users will be provided non-local materials like ceramic combustion chamber, chimney outlet and pieces of iron rods. Users will get subsidy on the purchase of stove from project authorized retailers in case of prefabricated portable model.

In addition, the project has provision of fixed period warranty on non-local materials of the fixed stove and components of the portable stove.

The promoters will be free to disseminate the stoves outside the project area. However, such stoves will not be subsidized neither counted under the project progress. CRT/N and local partner organisations will provide technical back up support to the stove users as far as possible. In case of portable stove also, the manufacturers and retailers are free to sale the stoves to the users residing outside the project area but such sales will not be subsidized; the sales should take place in full cash basis. Such stoves will not be counted in the emission reduction calculation.

CRT/N will own the emission reduction (ER) after having been transferred this right by the stove users. CRT/N will transfer this ER right secured from the users to Egluro through Emission Reductions Investment Agreement. This will help Egluro to recover its cost involved in pre-financing the project. When a user installs or purchases a stove it will be his/her property and will possess the right of ER. However, as the CDM funding is helping to implement the project and carry out the planned project activities (indirect subsidy) and also providing direct subsidy for the fuel efficient stove to deliver it at an affordable price, the user agrees to transfer all CERs to CRT/N as the main implementing organization. The users also cooperate with CRT/N on training, installation, monitoring, demonstration, testing and stove replacement activities and use the fuel efficient stove only, throughout the entire crediting period. The users dismantle the traditional stoves. The users sign the stove installation/sale or ER transfer slip which stipulates the name, address, telephone number, stove serial number, date installed/sold and signature of the user. Apart from this, the slip also contains the statement that the carbon finance has been used for project implementation and delivery of project activities and stove subsidy has been received by the stove user. This information obtained from the users will be transferred to the electronic database and the hard copy will be stored in CRT/N office in Kathmandu.

Project participants' view on the contribution of the project activity to sustainable development

The proposed project will significantly contribute to sustainable development through a number of social benefits at local level. Reduced indoor air pollution and hence better health of users apart from the reduction in time and energy spent by women and children in collecting fuel wood for cooking, are the major household benefits. The time saved by women could be used for better child care and other income generation activity. Thus the living condition of the poor families in the area will be improved through reduced fuel wood consumption, reduced indoor air pollution and less time and energy required for fuel wood collection and cooking.

The project will train the local people to build fuel efficient stoves thus helping to build capacity at local level and creating self employment opportunity for up to 80 stove promoters in each district with more than 50% women. The promoters will be paid by the end- users in cash or kind thus generating income to their family and increasing their level of income.

The project will also train Local Partner Organisation (LPO) staff for effectively carrying out stove project activities. Thus the capacity of LPOs to implement stove project in the area would be developed after this project.

Besides there will be a number of private entrepreneurs identified to fabricate, distribute and retail the portable stove in the project districts apart from the network of local partners (forest user groups, community micro finance groups, women groups cooperatives) who will also be involved in publicity campaign of fuel efficient stoves. This will contribute to the additional employment.

Further the introduction of locally manufactured technology with improved energy efficiency helps in technological self-reliance in the area.

At the national level, by providing fuel efficient stoves, the proposed project supports the Government's efforts on development of environment friendly energy technology for improving the quality of life of rural people through enhanced productivity and increasing employment opportunities, as outlined in the Three Year Interim Plan (2007-2010) objective. Furthermore, the project will decrease the pressure on forest due to reduced fuel wood consumption in the project households thus helping to save the local environment. The project will support global environment by reducing GHG emissions.

The existing practice of burning traditional biomass fuel in rudimentary and inefficient stoves, in kitchen with poor ventilation causes excessive indoor air pollution (IAP) and has been a serious health risk for women and children who spend several hours in the kitchen. The project aims to break this inefficient cooking regime of 22,920 households. The project will have some snowball effect and it is expected that more stoves are built/ sold after the completion of the project as the stove building skills and the entrepreneurship for fabricating portable stoves and other stove parts will be available locally after the project implementation apart from the establishment of supply chain of fuel efficient stoves in the project districts.

A.3. Project participants:

>>

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)
Government of Nepal (Host)	Private Entity (NGO): Centre for Rural Technology, Nepal	No
United Kingdom	Private Company (Project Investor): Egluro	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

>>

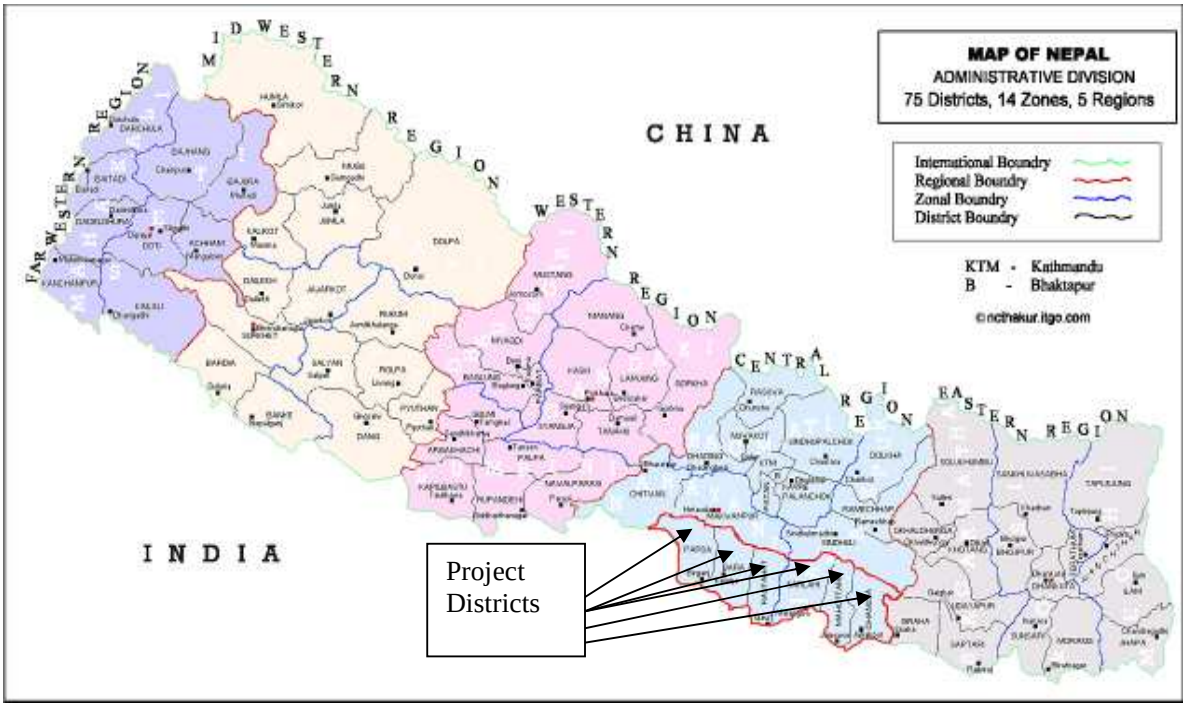
A.4.1.1. Host Party(ies):

>> Federal Democratic Republic of Nepal

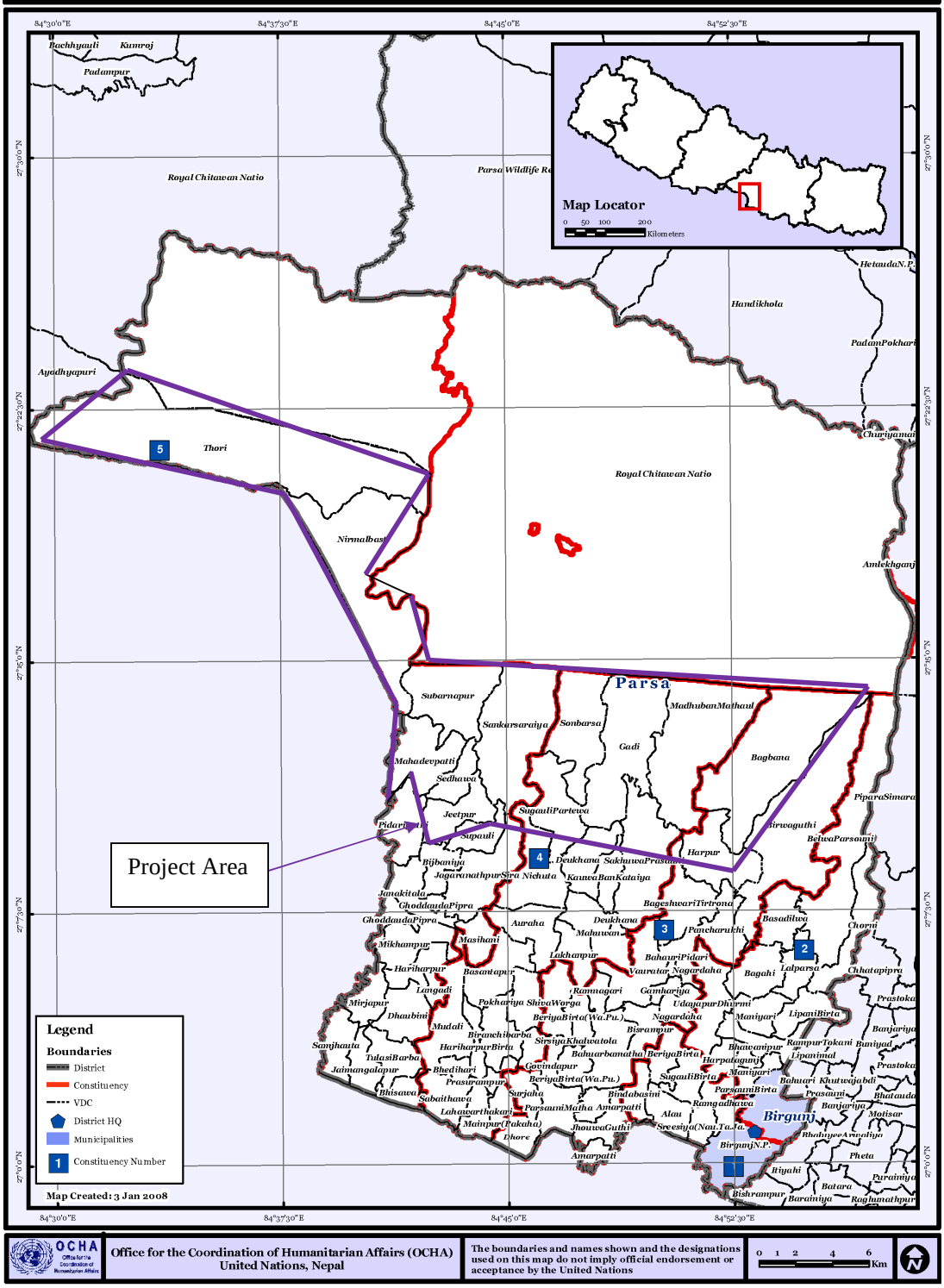
A.4.1.2. Region/State/Province etc.:

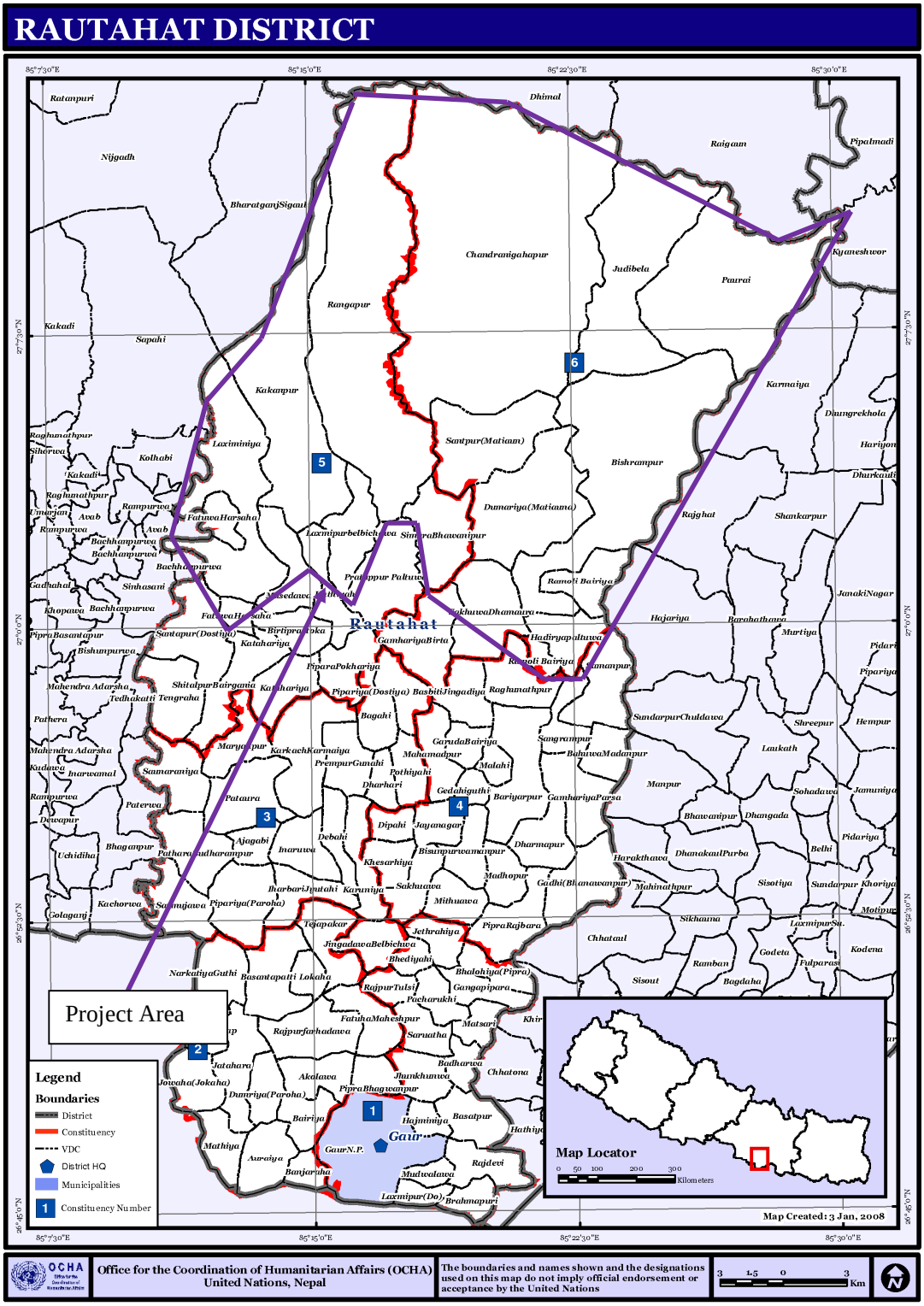
>> The project is located in the foothills and plain areas in the Central Development Region of Nepal. The project area includes six districts, namely: Bara, Parsa, Rautahat, Sarlahi, Mahottari and Dhanusa.

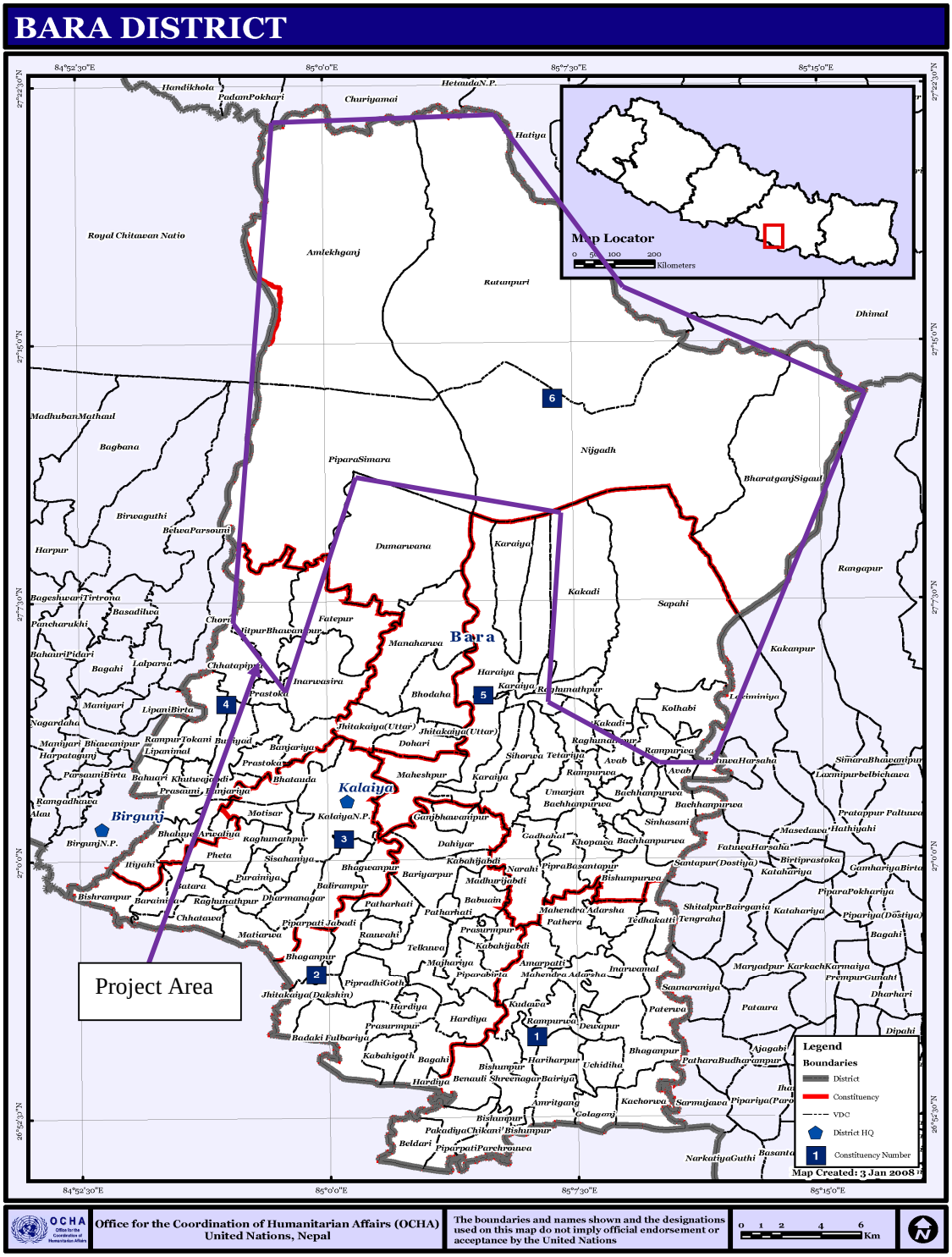
Fig: I

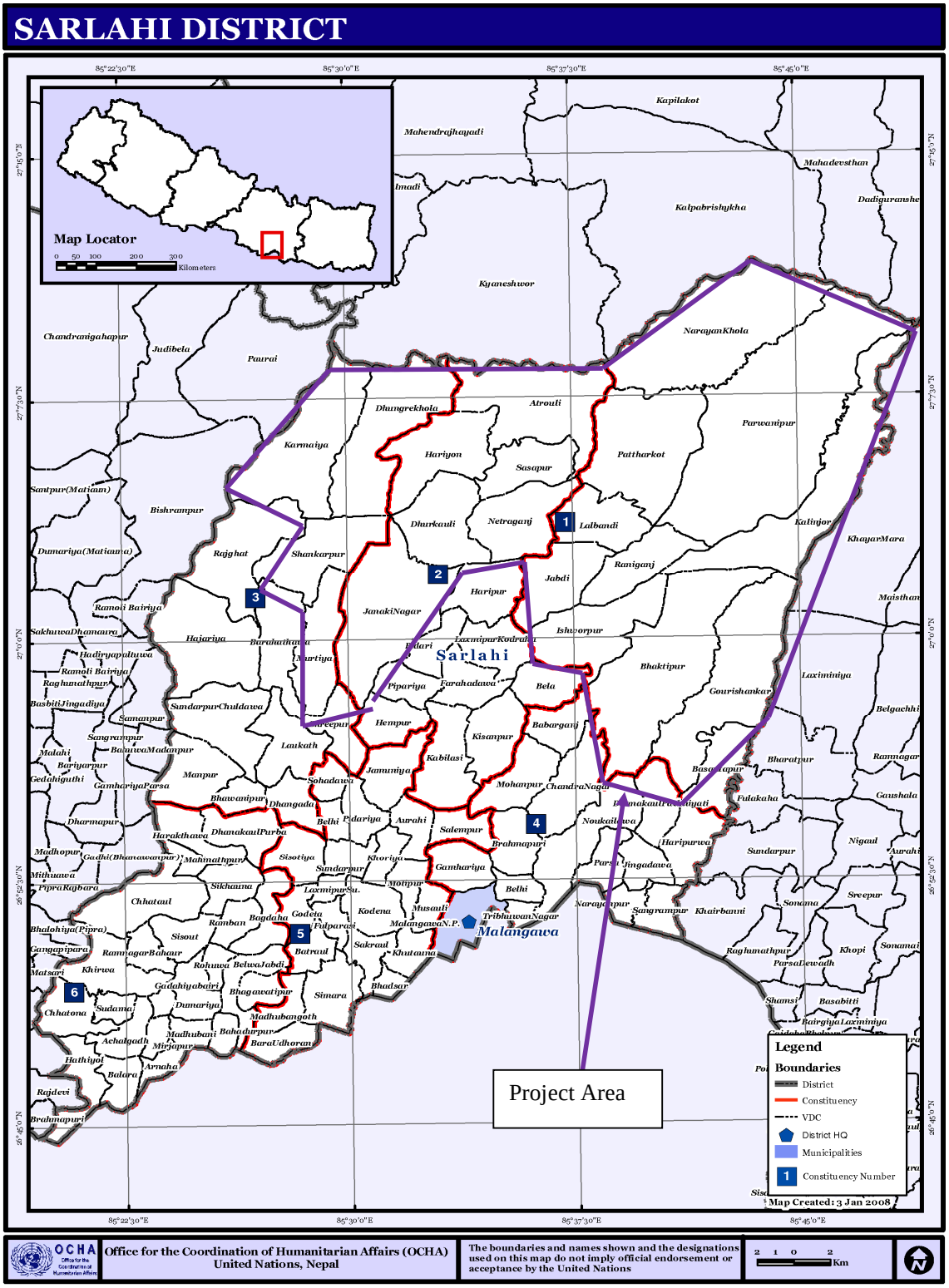

MAP OF NEPAL
ADMINISTRATIVE DIVISION
75 Districts, 14 Zones, 5 Regions
International Boundry
Regional Boundry
Zonal Boundry
District Boundry
KTM - Kathmandu
B - Bhaktapur
©nchakur.itgo.com
CHINA
INDIA
MIDWESTERN REGION
FAR WESTERN REGION
WESTERN REGION
CENTRAL REGION
EASTERN REGION
Project Districts

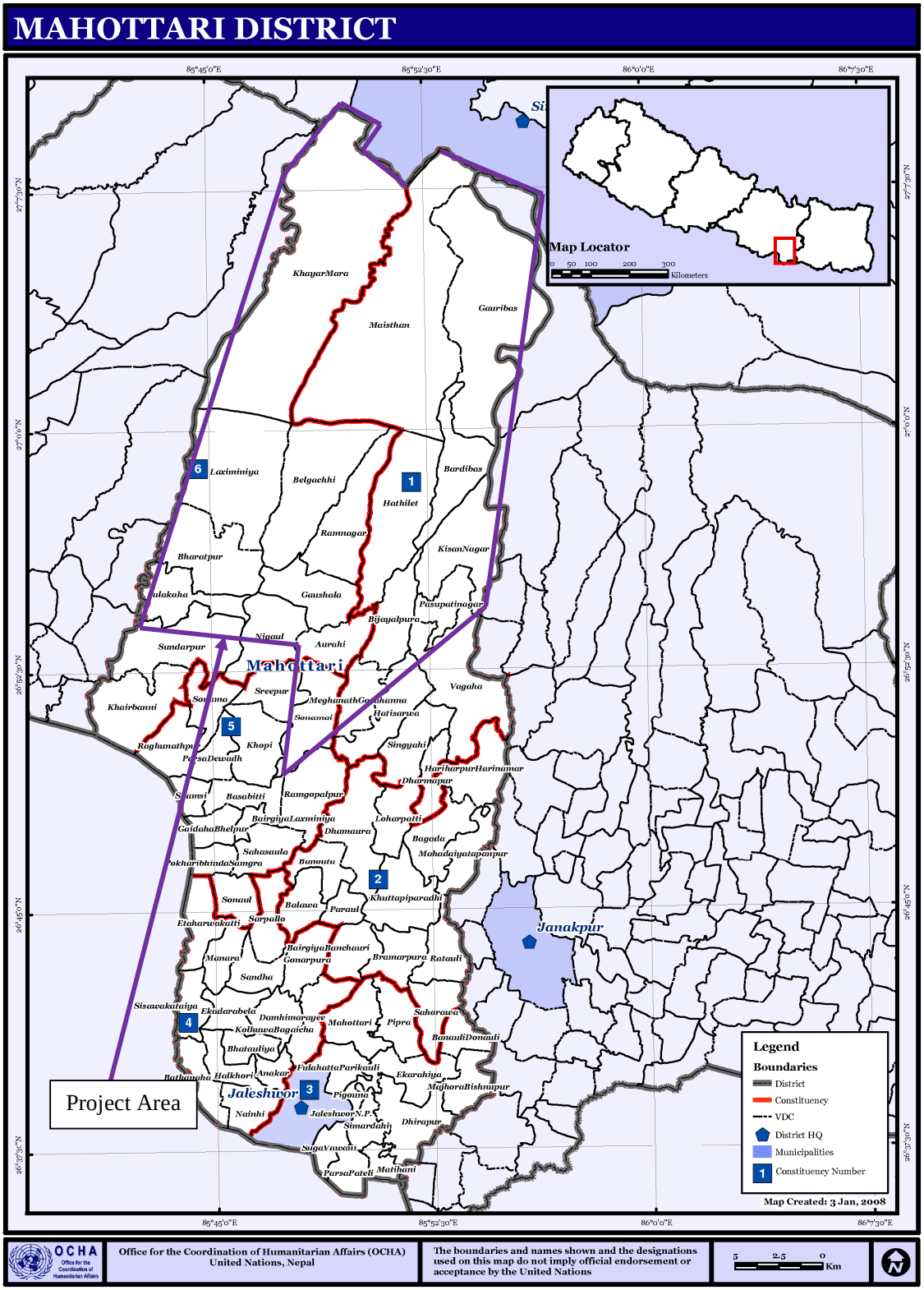
PARSA DISTRICT




RAUTAHAT DISTRICT
Rautahat
Gaur
Project Area
Legend
Boundaries
District
Constituency
VDC
District HQ
Municipalities
Constituency Number
Map Locator
Kilometers
Map Created: 3 Jan, 2008
OCHA
Office for the Coordination of Humanitarian Affairs (OCHA)
United Nations, Nepal
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations
Km


BARA DISTRICT
Project Area
Map Locator
Legend
Boundaries
District
Constituency
VDC
District HQ
Constituency Number
Map Created: 3 Jan 2008
Office for the Coordination of Humanitarian Affairs (OCHA)
United Nations, Nepal
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations
Bara
Birgunj
Kalaiya


SARLAHI DISTRICT
Map Locator
Project Area
Legend
Boundaries
District
Constituency
VDC
District HQ
Municipalities
Constituency Number
Map Created: 3 Jan 2008
Office for the Coordination of Humanitarian Affairs (OCHA)
United Nations, Nepal
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations
Sarlahi
Malangawa


MAHOTTARI DISTRICT
Map Locator
0 50 100 200 300 Kilometers
Project Area
Mahottari
Jaleshwor
Janakpur
Legend
Boundaries
District
Constituency
VDC
District HQ
Municipalities
Constituency Number
Map Created: 3 Jan, 2008
OCHA
Office for the Coordination of Humanitarian Affairs (OCHA)
United Nations, Nepal
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations
5 2.5 0 Km

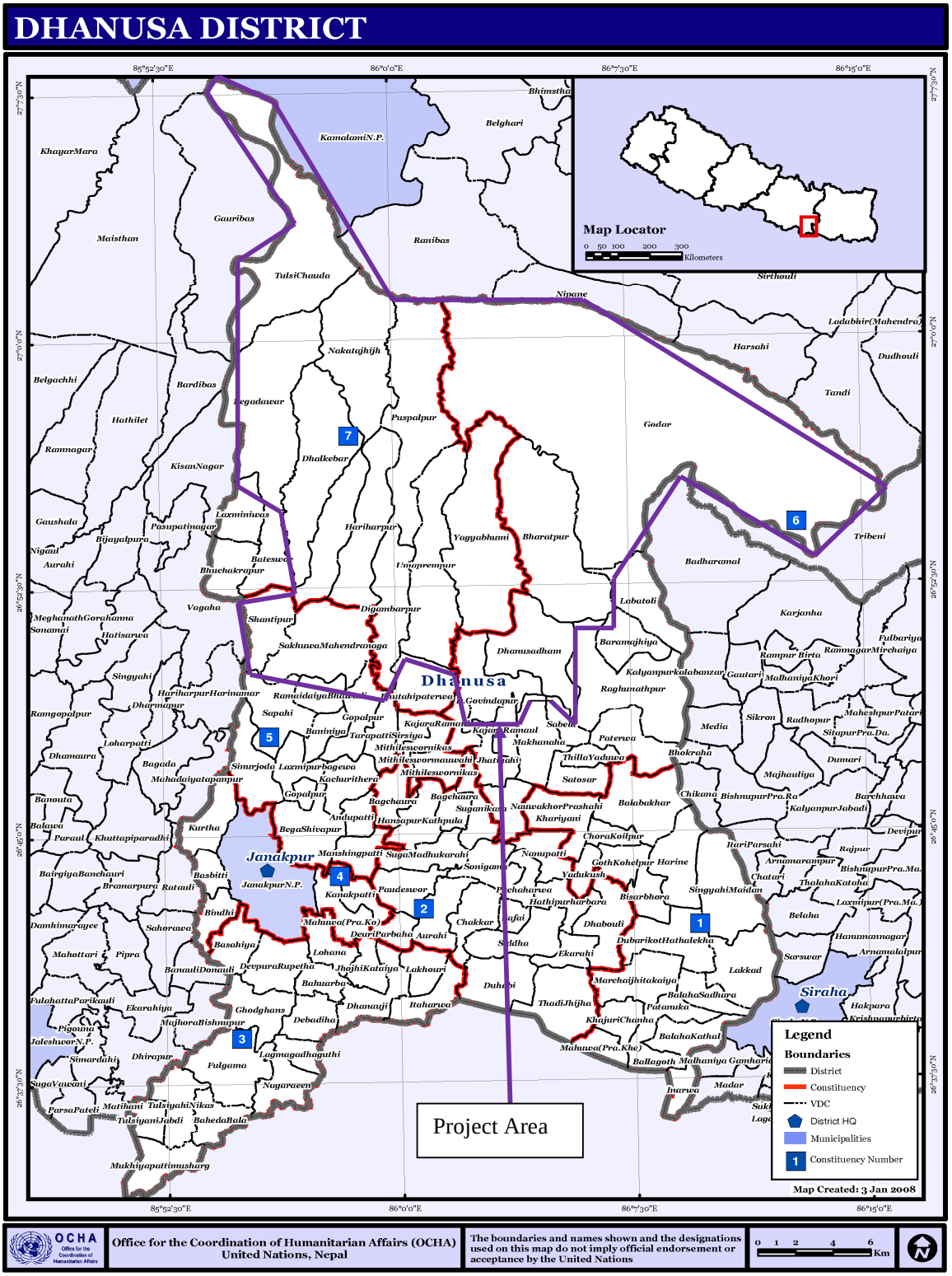

DHANUSA DISTRICT
Map Locator
0 50 100 200 300 Kilometers
Project Area
Legend
Boundaries
District
Constituency
VDC
District HQ
Municipalities
Constituency Number
Map Created: 3 Jan 2008
Dhanusa
Janakpur
Siraha
OCHA
Office for the Coordination of Humanitarian Affairs (OCHA)
United Nations, Nepal
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations
0 1 2 4 6 Km

Fig: II Existing Cooking Appliances

Fig: III Fuel Efficient Cooking Devices

Built-on-site model

Prefabricated model

A.4.1.3. City/Town/Community etc:

>> The project will be 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.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

>> The project will be implemented in six districts lying within $26^0$38'00"-$27^0$30'00" north latitude and $84^0$22'00"-$86^0$14'00" east longitude.

District	District coordinates	
	Latitude	Longitude
Parsa	26°55'0"N-27°30'00"N	84°22'0"E-85°13'00"E
Bara	26°52'00"N-27°27'22"N	84°52'00"E-85°16'00"E
Rautahat	26°40'00"N-27°14'00"N	85°10'00"E-85°31'00"E
Sarlahi	26°42'00"N-27°08'00"N	85°20'00"E-85°49'00"E
Mahottari	26°40'00"N-27°08'00"N	85°41'00"E-85°59'00"E
Dhanusha	26°38'00"N-26°57'00"N	85°51'00"E-86°14'00"E

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

>> According to the categorization of Appendix B to the simplified modalities and procedures for small-scale CDM project activities (in accordance with paragraph 6 (c) of decision 17/CP.7), the proposed project can suitably be categorized as:

Type (II): energy efficiency improvement projects

Category: G. Demand-side energy efficiency programmes for specific technologies

The latest available methodology for Type II Category G projects is described in AMS-II.G/Version 02, Sectoral scope: 03, EB 51.

The project promotes appliances involving the efficiency improvements in the thermal applications of non–renewable biomass by introducing more efficient biomass fired cooking stoves.

The fuel efficient cooking stoves to be promoted under the CDM project are the improved version of the two pot mud-brick stove promoted in the mid-hill areas by the Biomass Energy Support Programme of the Alternative Energy Promotion Centre under its Energy Sector Assistance Programme 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. Introduction of ceramic liner in the combustion chamber and addition of insulation and heat retention gives better control of quality and dimensional accuracy apart from increased efficiency, compared to existing improved cooking stoves being promoted in the mid-hills region. The improved version is suitable for the foot hills

[7] VDC stands for village development committee which is the smallest administrative unit in the district. Nepal is divided administratively into 5 development regions, 14 zones, 75 districts and 3,995 Village Development Committees.

for the migrated communities from hills and mountains for their cooking practices. The low chimney height is suitable for low roof height of the kitchen shed.

The improvement also provides consistency in design and dimension. The efficiency of these stoves is in the range 30.65%-33.46% and fuel saving 30-50%, compared to the existing traditional open fire stoves. This model provides two items of cooking at a time and reduces overall cooking time.

Likewise, the project will also promote a pre-fabricated model, a modified version of mud/metal rocket stove to suit the local cooking needs and preferences of different ethnic groups and communities in the project districts regardless of the type of houses and kitchen. The efficiency of these stoves is in the range 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 to meet the requirements of the people living in Terai region of Nepal. The minimum life of these stoves is taken as 3 years since life of similar but older versions of stove has been reported by Energy Sector Assistance Programme (ESAP) as 3- 5 years if properly maintained by the users[8].

The fixed stove model has been field tested in 2008 in the villages of Chitawan district with similar socio-economic characteristics and cooking needs as in the proposed project areas. The prefabricated model was tested at CRT/N premises by Kathmandu University, Department of Mechanical Engineering Researchers and field test has been carried out in Bara a project district. Both these stoves models serve all the requirements like cooking, heating, frying, baking bread and boiling water as in the traditional stoves.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

>>

Years	Annual estimation of emission reduction (tCO2e)
2011[#]	8392
2012	30604
2013	33166
2014	33166
2015	33166
2016	33166
2017*	24773
2018*	2561
2019*	0
2020	0
Total emission reductions (tonnes of CO_2e)	198994
Number of crediting years	10[Φ]
Annual average reductions over the crediting period (tCO_2e); 10 year average	19899

[#] Start date of the crediting period (01/05/2011 or date of registration whichever is later)

[8] AEPC/ESAP Biomass Component Description: http://aepc.gov.np/index.php?option=com_content&task=blogcategory&id=19&Itemid=37

* The emission reduction (ER) will be accounted for if the project extends support to the stove users to replace the appliance for second time.
Φ 10 years will apply only if the project extends support to the users to replace the stoves for second time.

A.4.4. Public funding of the small-scale project activity:

>> There is no public funding involved in the project. CDM revenues will be utilized for the entire cost of implementing project activity including the subsidy for efficient cooking stoves.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

Proposed small-scale project is not a de-bundled component of a large project activity since there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous two years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

This is the first project of its kind to apply on small scale methodology AMS II. G in Nepal.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

>> The project follows the methodology outlined in the small scale project activity category in Type II AMS IIG. / Version 02 EB 51 “Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass"

B.2 Justification of the choice of the project category:

>> The AMS-II.G/Version 02 EB 51 document mentions that "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."

Since the fuel efficient stoves which will be promoted under the project proposed reduce the consumption of woody biomass from non-renewable sources, the project qualifies under the section II.G of the small scale guidelines. The proposed project activity involves dissemination of high efficiency biomass fired cook stoves or ovens and saves non-renewable woody biomass that otherwise would have been consumed by less efficient traditional stoves.

The threshold limit of the small-scale activity is 180 GWh annual thermal energy savings (equivalent to 60 GWh electrical energy). Thermal energy savings of efficient stoves are calculated by multiplying the annual biomass savings of each efficient stove with the calorific value of fuel wood:

Thermal Energy Savings = By,savings * NCVbiomass
= By*(1- η_{old} / $\eta_{new\ max}$)* NCVbiomass
= 2.7t (1-.10/./.32854)*4167*10^{-6}GWh/t
= 0.0078264 GWh

Where:

By	Quantity of woody biomass used in the absence of project activity in tonnes (see Section B.4.)
η_{old}	Efficiency of the system being replaced (0.10) (see Section B.4.)
$\eta_{new,\ max}$	Efficiency of the system being deployed as part of the project activity (0.3284) (see Section B.4.).
$NCV_{biomass}$	Net calorific value of the non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, corresponding to 4167 kWh/t) (see Section B.4.)

The maximum number of efficient stoves eligible to be operational in any year during the project activity is therefore limited to 180GWh/0.0078264 GWh = 22999. As part of monitoring it will be ensured that the total energy saved through efficiency gains by the stoves installed under the project will not exceed 180 GWh for any year of the crediting period. According to the information regarding stove efficiency available at validation the approximate number of stoves that may be installed and operated at a time is 22920.

Type II Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass	This project promotes energy efficient fuelwood cooking stoves that use thermal energy for cooking. The project aims to reduce use of non-renewable woody biomass. Non renewable biomass saved by the already two registered biogas CDM projects in the region has been taken into account to calculate the fraction of non-renewable woody biomass. The amount of non-renewable biomass saved by two registered biogas projects in the project appears however not significant. (Please refer B.4.4 of PDD, Annex 3B, and adjustment of Fraction of NRB in excel sheet).Further the fuel efficient stoves under the project activity is only installed in the houses where biogas plant is not installed and thus double counting of non-renewable biomass saved is not applicable.
Category Gis category comprises appliances involving the efficiency improvements in the thermal applications of non-renewable biomass.	-
Small-scale project activity The threshold limit of the small-scale activity is 180 GWh annual thermal energy savings (equivalent to 60 GWh electrical energy).	-

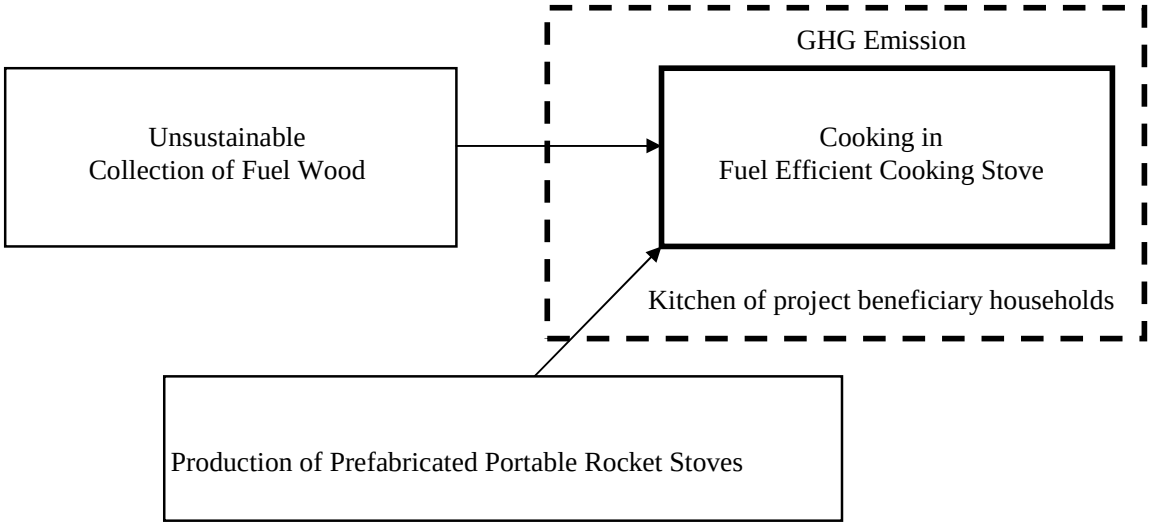
Non-renewable biomass has been used since 31 December 1989	It has been observed from the baseline survey that the use of non-renewable biomass has been before 31 December 1989.The information was derived from the field interview with the respondents during the baseline survey. Please refer to Annex 3A Baseline information.
The project should reduce non-renewable biomass being used	According to AMS-II.G v02, use of non-renewable biomass is confirmed if at least two of the following indicators support the assertion: a) increase in time spent or distance travelled by users, b) survey results show that carbon stocks are depleting in the project area, c) increase in fuelwood price, d) trends in the quality of fuelwood being collected. The household sample survey conducted in May 2009 demonstrated the following: Time needed to collect firewood increased from 1.46 hour in 1989 to 4.12 hour in 2009. Distance travelled to collect firewood increased from 2.37 km in 1989 to 5.83 km in 2009. Price of firewood increased from NPR 31.98 per bundle in 1989 to NPR 143.48 per bundle in 2009. About 3.6 percent households used low grade fuelwood in 1989 while about 77.4 percent households have been found using low grade fuelwood in 2009. All these indicate that use of non renewable biomass is in increasing trend over last 20 years period. (Please refer Baseline Information Annex 3A in PDD and the Baseline Survey Final Report, October 2009).

B.3. Description of the project boundary:

>> The geographical project boundary is the households that install/ use fuel efficient cooking devices in up to 120 Village Development Committees in 6 districts, namely, Bara, Parsa, Rautahat, Sarlahi, Mahottari and Dhanusa where non-renewable biomass is the dominant fuel used. The fuel wood consumed by project beneficiaries is collected from the forests in the mentioned VDCs.

The other aspect of project boundary is the cooking activity in the kitchen by up to22920 stove user-households in the project area.

Project Boundary and GHG Emissions
Fig:III



B.4. Description of baseline and its development:

>> **Baseline Scenario**
In absence of the project activities, the intended beneficiaries of the project would continue using the traditional inefficient cooking stoves, consuming high quantity of non-renewable biomass. According to AMS II.G, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs by the project households. Thus baseline scenario is determined by calculating baseline emissions.

Determination of baseline Emissions
In order to determine the baseline emission the following parameters have to be determined.
1. *Average annual biomass consumption per household(B_y)*
2. *Fossil fuels likely to be used by similar project people.($EF_{projected\ fossil\ fuel}$)*

1. The energy baseline of the project is the total energy consumed for cooking by the fuel efficient stove users households in a year. A baseline survey was conducted in the six project districts in May 2009 from external consultant; the final report was submitted in October 2009. The survey included 480 (but only 477 were considered) households in the project area which were selected following multi-stage sampling technique (see Annex 3A, Baseline Survey Final Report, October 2009). According to the survey 96% households used firewood for cooking in varying degree and the average annual consumption of fuel wood for cooking is 2.7 tonnes per household. Therefore,

Total consumption of fuel wood by all beneficiary households = 2.7 t * 22920 = 61884 t per year

Now, energy baseline = total fuel wood consumed * NCVbiomass

= 61884 t * 0.015 TJ/t = 928.26TJ per year

The NCV value for biomass is 0.015TJ/t as per the IPCC.

2. The emission baseline is calculated multiplying the energy baseline by the emission factor.
According to AMS II.G., the emission factor for the substitution fuel likely to be used by similar consumers should be taken.

National Census 2001 shows that in all six project districts, kerosene is the second alternative to fuelwood for cooking. Nepal Living Standard Survey 2003/04 shows that kerosene is the second alternative to fuelwood for cooking for first four quintiles (poorer sections) of the population indicating only the richest section use other energy sources e.g. LPG more commonly. Since the target of the CDM project i.e. users of the improved stoves is mainly the poor people, kerosene can be taken as the second alternative fuel for cooking.

Comparing total installation of biogas plants (BSP 2009, publication of the Biogas Support Programme) with total potential number of biogas user households it is found that 0.9% to 6.6% of the households in the project districts have installed biogas plants. If the comparison is made with total number of households in the districts (VDC Profile of Nepal, 2008), only 0.4% to 2.8% households in the district are found to have biogas plants suggesting that biogas has not been in common use as second alternative fuel in the districts.

Biogas User's Survey[9] conducted by East Consult for Alternative Energy Promotion Centre also confirms that kerosene is the fossil fuel mostly used for household energy for lighting, cooking in most of the rural areas in plains (Terai) after biomass.

As such, following the suggestions made by the AMS II.G we consider kerosene as the most likely substitute for the same thermal energy needs. Hence, the IPCC value of emission factor 71.5 tCO2/TJ for kerosene can be taken as emission factor.

Therefore, emission baseline = energy baseline* fraction of non renewable biomass * emission factor
= 928.26 TJ *.81* 71.5 tCO2/TJ = 53760.18 tCO2 per year

In 10 years time, the project households will emit a total of 53760.18 tCO2 per year * 10 years = 537601.80 **tCO2** in absence of the project activities.

Baseline Emission

Year	Baseline Emission
2011	53760.18
2012	53760.18

[9] Biogas User's Survey2003/2004

2013	53760.18
2014	53760.18
2015	53760.18
2016	53760.18
2017	53760.18
2018	53760.18
2019	53760.18
2020	53760.18
Total	**537601.78**

3. Efficiency of the traditional cooking devices (η_{old}) and the improved cooking devices (η_{new})

As per AMS II.G, quantity of woody biomass saving is the product of average annual woody biomass consumption of traditional cooking device (By) and the increase in efficiency (1- η_{old} /η_{new}) of the improved cooking device introduced in the project. 'Water Boiling Test' was performed on 17-18 September, 2009 to evaluate the performance of the new devices using the testing protocol (WBT version 1.5) developed by Household Environment and Health (HEH) project, Shell Foundation. The testing protocol include three phases of test: Phase I: high power cold start, Phase II high power hot start and Phase III low power simmering test. The combination of these tests is intended to measure the stove's performance at both high and low power outputs, which are important indicators of the stove's ability to conserve fuel. The test for the improved cooking devices was carried out in CRT/N premises by the researchers/ professionals from the Department of Mechanical Engineering, Kathmandu University. The tests involved boiling 5 litres of water in the first pot and measuring the sensible heat of the water in the second pot when the first pot reached the boiling temperature. The time taken to boil the water in the first pot and fuel wood consumed during that process were measured to find out the thermal efficiency. Each of the cold start and hot start test was done for 3 times and the average of those values was taken to get the final efficiency. *The testing protocol also includes simmering phase and this portion of the test is designed to test the ability of the stove to simmer water using a minimal amount of fuel.* The simmering phase of the test was not conducted as this will not significantly affect the efficiency of the stove and the two phases (high power cold start and high power hot start) was considered reasonably sufficient to determine the efficiency for the cooking practices in the project area. However, the simmering test will be included in the field monitoring as part of stove testing process to evaluate the overall performance of the stove (see Annex 3C for details of efficiency test).

Test results:

A. Built on–site model

WBT 01

S. N.	Type of Start		Type of fuel	Weight of Fuel (Kg)	Moisture Content (%)	Calorific Values (KJ/Kg)	Temperature (O C)				Efficiency (%)
	Hot	Cold					Initial Pot 1	Final Pot1	Initial Pot 2	Final Pot 2	
1		√	Firewood	0.635	18	14642	25.9	95.8	25.9	56.2	30.86
	√		Firewood	0.533	18	14642	27.1	95.8	28.4	55.2	33.23

WBT 02

S. N.	Type of Start		Type of fuel	Weight of Fuel (Kg)	Moisture Content (%)	Calorific Values (KJ/Kg)	Temperature (O C)				Efficiency (%)
	Hot	Cold					Initial Pot 1	Final Pot1	Initial Pot 2	Final Pot 2	
1		√	Firewood	0.638	18	14642	26.8	95.8	26.8	54.2	31.04
	√		Firewood	0.674	18	14642	26.9	95.8	26.9	57.3	30.65

WBT 03

S. N.	Type of Start		Type of fuel	Weight of Fuel (Kg)	Moisture Content (%)	Calorific Values (KJ/Kg)	Temperature (O C)				Efficiency (%)
	Hot	Cold					Initial Pot 1	Final Pot1	Initial Pot 2	Final Pot 2	
1		√	Firewood	0.741	18	14642	27.8	95.8	27.8	64.2	31.08
	√		Firewood	0.599	18	14642	28.5	95.8	28.5	61.0	33.46

B. Improved Rocket Stove

WBT Test-01

S. N.	Type of Start		Type of fuel	Weight of Fuel (Kg)	Moisture Content (%)	Calorific Values (KJ/Kg)	Temperature (O C)		Efficiency (%)
	Hot	Cold					Initial	Final	
1		√	Firewood	0.527	18	14642	28.5	95.8	28.72
	√		Firewood	0.519	18	14642	28.6	95.8	30.39

WBT Test-02

S. N.	Type of Start		Type of fuel	Weight of Fuel (Kg)	Moisture Content (%)	Calorific Values (KJ/Kg)	Temperature (O C)		Efficiency (%)
	Hot	Cold					Initial	Final	
1		√	Firewood	0.492	18	14642	26.8	95.8	29.08
	√		Firewood	0.477	18	14642	28.2	95.8	30.43

WBT Test-03

S. N.	Type of Start		Type of fuel	Weight of Fuel (Kg)	Moisture Content (%)	Calorific Values (KJ/Kg)	Temperature (O C)		Efficiency (%)
	Hot	Cold					Initial	Final	
1		√	Firewood	0.514	18	14642	27.9	95.8	28.9
	√		Firewood	0.494	18	14642	28.2	95.8	30.29

Conclusion:

The firewood consumed to get the 5 litre water boiled in the first pot and to raise 5 litres of water in the second pot from 26^0 C to 55^0 C varied from 599-741 grams and the efficiency of the stove achieved was in the range 30.65%-33.46%.Similarly, the efficiency of the portable stove from the test is in the range 28.72%-30.43% as obtained from the Water Boiling Test as noticed from the table above.

The above values are obtained from the test carried out at CRT/N premise which is closer to lab condition than field condition. The kitchen condition in the project areas is different from that in CRT/N premises. Further the efficiency during rainy season may differ slightly in dry season and other months of the year. Therefore to compensate those errors and reasonably to be conservative, the lowest value of efficiency is considered.

It is estimated that the project will disseminate 80% built on site model and 20% portable rocket stove, so the weighted average value of the efficiencies of two stoves has been considered.

The lowest values of efficiency obtained from the test is taken for the calculation of emission reduction and the weighted average of the maximum value of efficiency from the test is considered to demonstrate the SSC limit.

Calculation of Weighted Efficiency for Demonstration of SSC limit:

Estimated build-on-site model to be disseminated in the project =80% and the maximum value of efficiency from the test =33.46%

Estimated portable model to be disseminated=20 % and maximum value of efficiency from the test =30.43%

Therefore weighted average efficiency= (0.8*33.46+0.2*30.43)/ 1.0

= 26.768+6.086

=32.854%

C. Existing Traditional Mud Stove in Project area

It is noticed from the baseline survey that semi enclosed traditional mud stoves, 3 stone stoves and the *odan chulo* (tripod stoves) are the commonly used stoves in most of the project areas[10] and the efficiency of these stoves are normally below 10%[11]. Since this conventional system lack improved combustion and air supply mechanism and flue gas ventilation system, the default value of 0.10[12] is taken into account for the purpose of emission reduction calculation.

Based on the efficiency as obtained from the tests for the fuel efficient stoves and adopting the default value for the existing stoves, the increase in efficiency is **1-0.10/0.2872= 0.65**

[10] Baseline Survey Final Report, October 2009

[11] Douglas F. Barnes, Kirk R. Smith et al (1994), What Makes People Cook with Improved Biomass Stoves, World Bank Technical Paper No 242.www.hedon.info/docs/whatmakespeoplecookwithimprovedbiomassstoves.pdf (p.4); K.M Sulpiya, ''Stoves used for cooking, water heating and space heating in Nepal used in Nepal, Boiling Point Issue 38 (1997)

[12] Annex 18 - AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (version 02)

4. Share of non-renewable biomass (fNRB,y) (see Annex 3B)

Establishment of the share of non renewable biomass is necessary to calculate the baseline emissions and emission reductions. For the definition of NRB the Executive Board decision of EB 23 Annex 18 and the Executive Board decision of EB 37 Annex 7 have been followed. Accordingly, baseline survey was conducted in 480 households of the proposed project area in May 2009 which showed the total household consumption of fuel wood as 4.6 tonnes/ household /year for various purposes. Besides, the survey also revealed that 96% of the surveyed households used firewood for cooking in varying degree and about 69% of the households surveyed collected firewood from the government forest which is depleting at 1.3% per annum[13]. The surveyed households also indicated that there has been an increasing trend in the average time spent to collect fuel wood, distance to travel to collect fuel wood and the price of fuewood over the last 20 years.

To complement the survey results, national statistics and government source of information has been used to calculate the fraction of non renewable biomass. Thus the NRB fraction has been derived from the following steps:

Step 1: Identification of Woody Biomass Production Area
Total woody biomass forest area, A = entire forest coverage area of districts =180392 ha[14]

Step 2: Estimation of Demonstrably Renewable Biomass (DRB)
Mean annual increment of wood, B =1.2 m^3/ha/year[15]
Annual increment of the woody biomass forest area, C= A*B= 216470.4 m^3
Density of fuel wood,[16] D = 0.87 tonne/ m^3,
Hence average annual increment in the entire forest (**DRB**), I = C * D = 188329 tonnes/ year

Step 3: The Average Harvest of Wood Fuel from Area A

Average number of households residing in project area (120 VDCs), J = 188291 households.
Timber and industrial consumption per household, k = 0.58782 tonnes/ year/ household[17]
Total timber and industrial harvest, M= K*J = 110681 tonnes/year
Average household wood consumption, L = 4.6 tonnes/year/household[18]
Total fuel wood consumption, N = L * J= 866139 tonnes/year/
Total harvest of wood from entire forest in the district, H= M+N = 976820 tonnes/year

[13] MFSC 1994 (Ministry of Forest and Soil Conservation, Government of Nepal)

[14] Forest Cover Change Analysis of the Terai District (1990/91 - 2000/01), Department of Forest, May 2005, Table 1, p. 6

[15] Average annual increment of the government managed forest in Nepal Department of Forest (DoF,2006)

[16] Forest Resources of Nepal (1987-1998), Publication No.74, November 1999.

[17] Master Plan for the Forestry Sector Nepal; Volume: forest Development Plan for the Supply of Main Forests Products (1987-1998); Derived from Projected Timber Consumption for Terai data (See Annex 3F) adjusted to population data in terms of households.

[18] Baseline Survey Final Report, October 2009

Step 4: The Shortage of Woody Biomass in the Area
Shortage of woody biomass (**Non Renewable Biomass**)[19], S = H - I = 788491 tonnes/year
Net shortage of woody biomass after adjusting NRB saved by registered Biogas CDM projects:
Net shortage(S') = S-NRB saved by biogas plants = 786430.9 tonnes/year
Step 5: The amount of Woody Biomass in the Project
Number of households G =22920
The amount of woody biomass in the project, O = G * L = 105432 tonnes
The share of non-renewable biomass is $f_{(NRB)y}$= S'/(S' + I) = 0.807
Where, S = Non Renewable Biomass and I = Demonstrably Renewable Biomass.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

>> The project reduces the amount of green house gases (GHGs) emitted through use of non-renewable biomass (firewood) as cooking fuels, by introducing widespread use of efficient wood stoves which replace existing inefficient traditional stoves usually 3 stone open fire or with semi enclosures or the equivalent.

Carbon finance has been identified as the only feasible method of up-scaling the stove project in the proposed area over the years. As CDM is the only external source of funding for the area, the project could not move ahead without it. The project activity is pre-financed for future CERs.

The UNFCCC Additionality Tool (Version 05.2, EB 39) requires that 4 steps are taken to demonstrate whether or not the reduction would be obtained in the absence of project activity. Taking these steps in turn:

Step 1: Identification of alternatives to the project activity consistent with mandatory laws and regulations

Sub Step 1a: Define alternatives to the project activity
The theoretical alternatives to provide the same service (i.e cooking) to households are:

a. The proposed project activity undertaken without using carbon finance.
b. Other realistic and credible scenarios that deliver outputs and services with similar quality
    b.1 Energy delivered at household level through liquid fossil fuels such as LPG, kerosene
    b.2 Energy delivered at household level through electricity and other renewable energy Technologies
    b.3 Energy delivered at household level through biogas
c. Continuation of the current situation

b. Other realistic and credible scenarios that deliver outputs and services with similar quality:

[19] Taken from Methodology for Improved Cook-stoves and Kitchen Regimes V.01 p.28, http://www.cdmgoldstandard.org/fileadmin/editors/files/6_GS_technical_docs/manuals_and_methodolgies/GS_Methodology_Cookstove.pdf

b.1 Only a minority of households in the project area mainly those living in towns or market centres cook with fossil fuels like kerosene or LPG[20]. Apart from this, there is no evidence of households in rural areas making a shift towards LPG for cooking which would be likely to result in lower greenhouse gas emissions than the project scenarios. In fact LPG and kerosene is too expensive for low income rural households in the project areas who use biomass (mainly fuel wood) for cooking.[21] The cost of per litre of kerosene in the project area is about US$ 0.95. The daily minimum wage of labour is US$ 2.4 and US$ 1.6 for male and female respectively[22].

b.2 There is no evidence that people with very low income are moving towards cooking with electricity because there is no distribution network in most areas and even if there is the network, it is very expensive to cook with the electricity and the supply of electricity is unreliable due to several hours of load shedding in the dry season. Mostly rural households use electricity for lighting except in the semi urban area where few households use rice cooker[23]. Although the government through Alternative Energy Promotion Centre is promoting alternative energy devices like solar cooker but this is beyond the reach of rural people because of high upfront cost even with subsidy. The bio fuel stove technology is not introduced yet in the project areas while the bio-charred briquette stoves are introduced in some areas but are not popular because of the unavailability of charred briquettes and not suitable for the cooking practices in the project area.

b.3 The high up-front investment cost of a biogas plant and at least two cattle heads required to feed the digester is a barrier for majority of low income farmers in the project area. So even with some incentive (subsidy) only a very few households will be able to afford and switch over to biogas fuel.

Outcome of Sub step 1a**:**
Thus in view of the above, the most realistic and credible alternative scenario to the project activity is the continuation of the current situation.

Sub Step 1b: Consistency with mandatory laws and regulations

a. The proposed project activity undertaken without using carbon finance.

There is a national program on improved stoves in the different geographical region (hills and mountain districts) but not in the Terai region where the proposed project districts are located. So there is no possibility of having improved stoves dissemination in the project area from the national program. Further there is no regulation which restricts use of traditional cooking devices or the collection of fuel wood from the government forest or community managed forest which makes the alternative scenario 'continuation of the existing situation' as the most realistic alternative to the project scenario.

b. Other realistic and credible scenarios that deliver outputs and services with similar quality
b.1 Energy delivered at household level through liquid fossil fuels such as kerosene and LPG

[20] Baseline Survey Final Report, October 2009

[21] http://www.nepalbiznews.com/newsdata/Biz-News/NOC,diesel-and-kerosene-.html)

[22] CRT/N 2009

[23] Baseline Survey Final Report, October 2009

A small segment of urban and market centre households in the project area use fossil fuel like LPG and Kerosene[24].Fossil fuel like LPG and even Kerosene is too expensive for poor people to use for cooking in the project area who use biomass for cooking. There is no regulation or mechanism in place that lowers the price of LPG to make it affordable to the low income people in the area.

b.2 Energy delivered at household level through electricity and other renewable energy Technologies

This is not mandated by law either from the centre or district level. Although the government through Alternative Energy Promotion Centre (AEPC) is promoting various renewable energy technologies like solar cookers, bio briquettes etc presently there is no other suitable technology (beside biogas) which will substitute the equal amount of the unsustainable fuel wood needed in rural households for cooking. Therefore, most likely the project participants will continue use of rudimentary stoves and unsustainable fuel wood.

b.3 Energy delivered at household level through biogas

This proposed alternative is also not mandated by law. Even with the existing government subsidy, only those households who can afford purchase the biogas plants under the BSP-Nepal household biogas promotion activity which covers 65 districts out of 75 districts in Nepal. So without the project activity, residents in the project areas would continue to use unsustainable fuel wood in the traditional appliances.

c. Continuation of the current situation: business as usual

This is in full compliance with current applicable laws and regulations since there is no local regulations or programmes in place to limit the use of inefficient traditional stoves. Although law concerning the protection of forestry areas exists in Nepal however, they are not effectively enforced in the government forest except the national parks and wild life reserves. Encroachment, Illegal harvesting of timber and non-timber products is a general practice in the government forest in Terai, a major source of fuel wood and fodder of the project area[25].

Outcome of Sub step 1b**:**

Therefore, the alternative c: continuation of current situation where dependence on traditional stoves for cooking with non renewable biomass will be most realistic.

Step 2: Investment Analysis

The proposed project being a small scale project, barrier analysis is conducted instead of investment analysis. However, a simple cost analysis has been performed as below.

Table: B.5.1 Cost breakdown of a fuel efficient stove

[24] Baseline Survey Final Report, October 2009

[25] Terai Arc Landscape(TAL)- Nepal, Annual Progress Report 2001/02; Baseline Survey Final Report, October 2009

Description	Total Cost (USD)	Total Cost (NRs)	Remarks	Data Source
A: 2 pot Adobe Stove (Built on site model)**	-	-	-	-
Local Materials clay, rice husk and cow dung	0.00	0.00	Available free	-
Iron rod	0.68	49.00	Contribution from Project participant. For the cost of iron rod, consultation has been made with the promoters involved in the Chitawan ICS Carbon Project. It has been clarified that for construction of an ICS, approximately 800 gms of iron rod was required which would cost about Rs. 49 (USD 0.62 at the conversion rate given below) per stove. (Cost figure derived for 800 g iron based upon the cost quoted for 60.5 kg in the evidence provided.) The market rate iron rod per kg was Rs 69 at that time; as of now the market rate of iron rod has increased to Rs 110. Accordingly, the cost of iron rod for 1 unit of ICS would be Rs. 88 (USD 1.22 with conversion rate 1 USD = Rs. 72.41 on 15-5-2010 from same source above). Taking increasing trend in market price of iron rod into consideration, the cost of iron rod has been estimated to be USD 1.5.	Chitawan Improved cooking stove (ICS) Carbon project.
Pottery liner with grate	0.32	23.50	Contribution from Project participant. The cost of pottery liner, grate and chimney outlet has been determined with reference to the evidence provided. As mentioned in the evidence the price of the pottery liner, grate and chimney outlet was Rs 47 (USD 0.64). (conversion rate 1 USD = Rs. 72.41)	Chitawan Improved cooking stove (ICS) Carbon project.
Chimney pipe outlet	0.32	23.50	Contribution from Project participant. The cost of pottery liner, grate and chimney outlet has been determined with reference to the evidence provided. As mentioned in the evidence the price	Chitawan Improved cooking stove (ICS) Carbon

			of the pottery liner, grate and chimney outlet was Rs 47 (USD 0.64). (conversion rate 1 USD = Rs. 72.41)	project.
Unskilled labour	0.99	72.00	Users' contribution. The user will contribute and help the promoter during the ICS construction and installation by preparing the mud and bricks. The users thus contribute about one day's labour charge which is assumed to be around Rs 80-100 as per the prevailing rate at the local level in Chitawan Project area, so the users' contribution is considered to be USD 1. (conversion rate 1 USD = Rs. 72.41)	Chitawan Improved cooking stove (ICS) Carbon project.
Skilled labour (stove builder)	3.49	253.00	User's contribution As per the consultation made with the promoters in the field a stove promoter would charge Rs. 200-300 for the construction of an improved stove. So, the cost of skilled labour has been considered as USD 3.49.	Chitawan Improved cooking stove (ICS) Carbon project.
User's Contribution	4.49	325.00	Local materials and labour	-
Contribution from PP for each user	1.33	96.00	Subsidy for non local materials	Based on Chitwan project price
Total cost of one built on site model	5.81	421.00	-	**Calculated**
User's contribution for all built on site model	164,596.05	11,918,400.00	-	-
Contribution from PP	48,619.14	3,520,512.00	-	-
B: Prefab Metal Portable Stove:*	-	-	-	-
Iron	3.00	217.23	Contribution from Project participant.	Quotation from private manufacturer
Ceramic liner and grate	5.00	362.05	Contribution from Project participant.	Quotation from private manufacturer
Skilled Labour/Transport	4.00	289.64	Users' contribution The cost breakdown is as per the quotation received from the manufacturer. Out of the total cost of	Quotation from private manufacturer

			USD15 (NRs1086.85), the project contribution will be USD 8(NRs.567.38) for the non-local materials (iron sheet and ceramic liner) as direct subsidy and the user's contribution will be USD 7(NRs519.47)for other than non-local materials like fabrication, overhead, vat etc. Subsidizing the cost of non-local materials from project is a general practice in similar other projects. The project contribution and user contribution is normally determined by the project participant and is a general practice in similar other project——	
Overhead and VAT	3.00	217.23	Users' contribution. The cost breakdown is as per the quotation received from the manufacturer. Out of the total cost of USD 15, the project contribution will be USD 8(as direct subsidy) and the user's contribution will be USD 7. This users' contribution will be paid in cash by users while purchasing the stove.	Quotation from private manufacturer
User's Contribution	7.00	506.87	-	-
Contribution from PP for every user	8.00	579.28	-	-
Total cost Prefab metal portable	**15.00**	**1086.15**	**-**	**Calculated**
Cost of all prefabricated model of stoves	137520.00	9957823.20	-	-
User's contribution for all prefabricated models	64176.00	4646984.16	-	-
Contribution from PP	73344.00	5310839.04	-	-
Overall direct contribution from PP for project activity.	121,963.14	8831351.04	The shortfall to be contributed from CDM revenue.	-

** Reference from Chitawan ICS Carbon Project
* As per quotation from a private manufacturer
Conversion Rate Source: www.nrb.org.np

It is imperative that if the CDM project is implemented, the users have to invest NRs 421.00 **(**USD 5.81) or NRs 1086.15 (USD 15) depending upon type of the stove they prefer. Besides the Project participants will contribute the direct subsidy for the fuel efficient stoves in the form of non-local materials. Considering a total of 22920 stoves to be disseminated during the entire project period the total contribution from the project participant will be NRs 8,831,351.04 (US$121,963.14) which is a revenue shortfall. CDM revenue will help in overcoming this revenue shortfall. The above cost of stoves is excluding the indirect cost of stove dissemination of NRs1000.00 (USD 15) which involves marketing, awareness and publicity campaign, demonstration, training, monitoring, testing, quality control, independent random survey etc as a part of project implementation.) In the most likely alternative of continuation of current situation, they have to invest no money at all. Hence, the proposed CDM activity is more costly than most likely alternative.

The CDM revenue will be utilized to cover the revenue shortfall of NRs 8, 831,351.04 (US$121,963.14) as given in Table B.5.1 which is the direct subsidy from the project participants.

Step 3: Barrier Analysis

Social Awareness Barrier

Only a minority of rural households in the project area mainly those living in towns and market centres purchase firewood in the market or use kerosene or LPG stove or electricity for cooking. For them saving of firewood is important and are willing to pay for the upfront cost of stove. Whereas the majority of the rural households do not buy firewood but collect it from the nearby forest which does not involve direct monetary cost although they have to spend a lot more time to gather this fire wood.[26] Further people are used to the traditional stove which is convenient as they have been using this simple device for generations. Changing their behaviour and shifting to improved stoves requires enormous efforts from project in the form of information, awareness, publicity and marketing campaign, demonstration etc. Besides, the cost of the project implementation at NRs 1000 per stove will be about NRs 45,840,000.00 which is an imminent barrier to overcome. The carbon finance will provide the funding for these activities.

Technology Barrier

The two pot adobe stoves are built in the kitchen by the trained stove builders (promoters). The present version of these stoves was improved recently and tested in the pilot project in Chitawan district. The verification study on Chitawan Project done by Winrock International Nepal shows that the model of stove has been piloted in Chitawan. These fixed and portable models are suitable for the cooking practices, needs and preferences of the proposed project area. Similarly, the metal rocket stoves have been improved and field tested recently. It has to be fabricated in the workshop in nearby town by trained technician for correct size and dimension. Furthermore, making the insulation bricks/liners requires special training to the local entrepreneurs. The Baseline Survey Final Report, October 2009 provides no evidence on dissemination of similar design of cooking stove in the six project districts although some sporadic promotion of improved cooking stoves has been reported. These recently improved models are

[26] Baseline Survey Final Report, October 2009

not available locally and significant adaptive research efforts have been made to improve these versions of stoves to make it suitable technically and socially for the project area.

The Baseline Survey Final Report, October 2009 provides no evidence on dissemination of similar design of cooking stove in the six project districts although some sporadic promotion of improved cooking stoves has been reported. The study clearly indicates that any suitable type of stoves have not yet been promoted in the six programme districts. These recently improved models are not available locally and significant adaptive research efforts have been made to improve these versions of stoves to make it suitable technically and socially for the project area. As such any structured infrastructure for implementation of a stove project, trained manpower (promoters) for fuel efficient stove installation and repair maintenance, trained manufacturers for manufacture of ceramic and chimney, human resource for implementation and monitoring of the project activities, local networking bodies, etc are not available in the area, which would lead to the risk of technological failure of any similar project implemented.
The proposed CDM project will disseminate portable rocket stove manufactured by trained manufacturers and two pot adobe stoves which are built in the kitchen by the trained stove builders (promoters), local manufacturers will be trained to produce ceramic and chimney outlet, capacity building of local partner organizations and awareness creation will also be done as a part of the project activity. Training and capacity building of local stove builders, local manufacturers and local partner organisation will involve significant cost (NRs 45,840,000.00) and is a barrier for the project. CDM finance will be used to overcome this barrier.
In the absence of the proposed designs, ICS promoted in the mid-hills would have been the options which are not suitable for plain areas of Terai and hence not popular.
The CDM revenue will be utilized to transfer the technology at local level through training of local promoters, local partner organisations and local manufacturers.

Sub Step 3b:
The continuation of the current situation does not face any of the above barriers. People have been cooking on such traditional stoves for many generations and they are the common practice.

Step 4: Common Practice Analysis

Sub Step 4a: Analyze other activities similar to the proposed project activity

The existing programmes/projects promoting ICS are;

- Biomass Energy Support Programme, the national programme supported by GoN, Danish and Norwegian government. The programme covers a total of 50 mid hill districts of the country excluding the proposed 6 Terai district.

(http://aepc.gov.np/index.php?option=com_content&view=article&id=127&Itemid=168)

- Chitawan ICS Carbon Project, implemented by CRT/N with support from TOCC includes only three Village Development Committees (VDCs) in Chitwan district.
- Promotion and Dissemination of Improved Cookstove Technology in Kapilbastu, Rupandehi and Nawalparasi districts in the plain region by Livelihood and Forestry Programme (LFP).

None of the above programmes have coverage in the proposed six districts.
(Please refer Baseline Information Annex 3A in the PDD and the Baseline Survey Final Report, October 2009)

Next, there were small scale improved cook stove programmes in the CDM project districts implemented by various NGOs with the funding support from donors in the past (more than 7 years back). However, these programmes were not wide spread but limited and have no significant effect in the project area.

Thus the proposed project is not a common practice in the entire Terai region of Nepal.

Sub Step 4b: Discuss any similar options that are occurring

The Biomass Energy Support Programme under the Energy Sector Assistance Programme (ESAP)[27] executed by the Alternative Energy Promotion Centre (AEPC) and funded by Danida and Norad, has been implementing large scale stove project in different geographical region (hills and mountains). This externally funded project is determined to achieve a reasonable coverage of households in the existing project districts which indicates that the project has to continue its resource in the existing project districts for next few years of its second phase duration and is unlikely to shift into project districts in the south.

The major differences between the past and ongoing ICS programmes and CDM project are as follows:

SN	Other ICS Programmes	CDM ICS Carbon Project
1	**Geographical difference** • BESP does not cover the proposed six Terai districts, only covers 50 mid hill and high districts	• The CDM Project covers six Terai districts Dhanusa, Mahottari, Sarlahi, Rautahat, Parsa and Bara
2	**Funding source.** • All the above mentioned programmes are donor funded, BESP funded by Government of Nepal(GoN), Norad and Danish Government, Chitawan Project[28] funded by TOCC[29] and the later project funded by DFID[30]	• The project will be solely funded by carbon revenue
3	**Technology** • The stoves disseminated under BESP are fixed mud stove and high altitude metallic stove • The adobe stoves (two-pot mud brick) that are promoted in the mid hills were not preferred in Terai districts of Nepal because of the type of	• The two-pot mud brick stoves promoted in hill areas under the Biomass Energy Support Programme are not suitable for plain areas of Terai and hence not popular. Because of the taller chimney, heavier mass of stove, variation in size and the cooking habit the adobe stove

[27] http://aepc.gov.np/index.php?option=com_content&view=article&id=85&Itemid=121

[28] The Chitawan project is a voluntary carbon project pre-financed by The Offset Carbon Company (TOCC), UK and implemented by Centre for Rural Technology, Nepal (CRT/N).

[29] http://crtnepal.org/annual_reports/annual_report_159309312010-04-0115930931.pdf

[30] CRT/N newsletter, July 2010, Vol. 10 No 2 'Promotion and Dissemination of ICS Technology in LFP Terai area' (scanned copy attached in Annex 3H); http://www.lfp.org.np/

	kitchen and the cooking practice.	disseminate in the hills is not preferred by the users in plains. The adobe stove planned to be promoted under the CDM project, although has gained social acceptance in other project areas e.g. Chitawan and LFP districts, is new to the current CDM project districts. The improvement made in the adobe stove model is the addition of better insulation and heat retaining device in the combustion chamber, decreased mass of the stove and reduced chimney height. Addition of these parts give better control of quality and dimensional accuracy apart from increased efficiency, compared to existing improved cooking stoves being promoted in the mid-hills region by BESP. • Similarly prefabricated portable model of rocket stove has been demonstrated field tested by CRT/N recently. The portable rocket stove is a new technology for rural areas of Nepal including the current CDM project districts. • These models have not been in use in the proposed project area before. Thus in terms of technology the model being promoted in the proposed project area are the improved versions and in terms of implementation the large scale dissemination have not taken place in the entire Terai Region.
4	**Operational strategy** • No provision of direct subsidy to users for construction of improved stoves in BESP except for the high altitude metallic stove. A subsidy amount of NRs. 4000 is provided for metallic stoves in areas with altitudes of 2000 meters or more.	• Non local materials for construction of stoves like ceramic liner, iron rod and chimney outlet will be provided by the project for adobe stove, about 40% of the total cost is provided subsidy to user/buyer from project side for rocket stove.

Hence, from the above discussion (modality, geography, technology), the proposed CDM project is a new option for the Terai region.

Conclusion
The above barrier analysis shows that the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As per the Small-Scale Methodology AMS II.G Version 02, "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" emissions reductions are calculated based on a fossil fuel emission with the same energy content as that of the displaced non-renewable biomass. The quantity of annual biomass used in the absence of project activity is determined using option (a) "Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of biomass per appliance (tonnes/year)".

As per the Baseline Survey Final Report, October 2009, the average quantity of firewood consumption of the families using traditional stove is 2.7 tonnes/year.

Likewise the baseline survey conducted in the pilot project, Chitawan in 2009[31] also showed the average quantity of firewood consumption by the families using traditional stove is 3.87 tonnes/year. A similar household survey carried out by WWF Nepal in the Terai districts under the TAL project in 2007 showed average household consumption of fuel wood using the traditional stove is 3.33 tonnes/year[32]. Thus, the average household consumption of 2.7 tonnes/year is lower as compared to the consumption trend of other areas. This is reasonable because the consumption is for cooking alone where as there are other uses like animal feed preparation and micro enterprises which also consume fuel wood and mostly the same stove is used for those purposes. Thus the value of 2.7 tonne/year or 225kg/ month is reasonably conservative as other than cooking is not included in the calculation.

Calculation of emission reductions per efficient stove in the project area

$$ERy = \sum_{i=1}^{N=12} ERm,i \qquad \ldots(i)$$

$$\mathbf{ER_m = B_m savings,_i * fNRB * NCVbiomass * EFprojected\ fossil\ fuel} \qquad \text{(ii)}$$

Where:

ER_y	Emission reductions during the year in t CO2e
$ER_{m,\,i}$	Emission reductions in the following month after the efficient cooking systems are deployed, in tonne CO_2e
$B_{msavings},i$	Quantity of woody biomass that is saved in tonnes per month
fNRB	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)
$EF_{\text{projected fossil fuel}}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers

31 Baseline Survey CRT-N/Winrock International, 2009

32 WWF Biogas VER PDD, September 2008

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)

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	By
Data unit:	Tonnes/year
Description:	Quantity of woody biomass used in the absence of project activity per household (in tonnes)
Source of data used:	Baseline Survey Final Report,, October 2009 (See Annex 3A, 3B) 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 $n=Z^2 x S^2/d^2$ 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 applied:	2.7
Justification of the choice of data or description of measurement methods and procedures actually applied :	A baseline survey was carried out at the project area by APTEC Consultancy (P) Ltd in May 2009. From the survey it was found out that the average consumption of fuel wood in the project area was 2.7tonnes/year. CRT/N along with Winrock International also conducted a baseline survey at Chitawan district in July 2009, which shows that average annual consumption of fuel wood is 3.87 tonnes/year per family using traditional cooking stoves. A similar household survey carried out by WWF Nepal in the Terai districts under the TAL project in 2007 showed average household consumption of fuel wood using the traditional stove is 3.33 tonnes/year. Reference #32: Baseline Survey Report CRT-N/Winrock International, 2009 Reference #33: WWF Biogas VER PDD, September 2008
Any comment:	The quantity of biomass used per month will be obtained by dividing the biomass used per year by 12.

Data / Parameter:	η_{old}
Data unit:	Fraction
Description:	Efficiency of the system being replaced
Source of data used:	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 applied:	0.10[33]
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value. Also from various literature sources, it is found out that the efficiency of traditional cook stove is below 10%.
Any 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:	H_{new}
Data unit:	Fraction
Description:	Efficiency of the system being deployed as part of the project activity
Source of data used:	Water Boiling Test carried out by professionals from Kathmandu University
Value applied:	0.2872
Justification of the choice of data or description of measurement methods and procedures actually applied :	A test carried out at CRT/N premises, by researchers/professionals from Kathmandu University shows that the efficiency of the stoves are 30.65-33.46% for Built-on-site stoves and 28.72-30.43% for the portable rocket stove. The testing was done on the prototypes of fuel efficient stoves to be disseminated in the project area. A standard testing protocol (WBT version 1.5) developed by Household Environment and Health (HEH) project, Shell Foundation was used during the test. http://ehs.sph.berkeley.edu/hem/page.asp?id=42 The lowest values of efficiecy obtained from the test which is 0.2872 has been considered for calculation of emission reduction. This value shall be compared with the ex post monitored value of efficiency and the conservative value shall be considered for ex post emission reduction calculation.
Any comment:	-

Data / Parameter:	f_{NRB}
Data unit:	Fraction

[33] Annex 18 - AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass (version 02)

Description:	Fraction of non-renewable woody biomass saved by the project
Source of data used:	• 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 applied:	0.807
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value for the non renewable biomass has been determined from the sources of data below: • The total household fuel wood consumption has been taken from the Baseline Survey Final Report, October 2009. • Total reachable forest area has been taken from the Department of forest data as this area is larger than that calculated from the reachable forest area obtained from the baseline survey. The baseline survey indicated that the fuel wood collection distance is within 5km radius from the village whereas the forest coverage is more than the 5 km radius from the project villages in all the districts. Thus the whole forest area of the district is taken into account to calculate non renewable biomass. Protected forest has been excluded from the reachable forest. • The Water and Energy Commission Secretariat of the government of Nepal which is responsible for energy related data for the country, has established the average fraction of non renewable biomass for the Terai as 0.83 (Energy Synopsis Report 2006, WECS, 2006, p. 15). • The WWF GS VER project has taken fNRB to be 0.87.
Any comment:	Proposed project area is in the central region of Terai.

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/t
Description:	Net calorific value of non-renewable woody biomass that is substituted
Source of data used:	IPCC default value for fuel wood
Value applied:	0.015 TJ/tonne
Justification of the choice of data or description of measurement methods and procedures actually applied :	Adopted IPCC 2006 default value.
Any comment:	-

Data / Parameter:	$EF_{projected\ fossil\ fuel}$
Data unit:	t CO_2/TJ
Description:	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data used:	IPCC default value for Kerosene
Value applied:	71.5 t CO_2/TJ

Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the suggestions made by the AMS II.G kerosene is considered as the most likely substitute for the same thermal energy needs. Hence, the IPCC value of emission factor 71.5 tCO2/TJ for kerosene can be taken as emission factor here.
Any comment:	-

Data / Parameter:	Ly
Data unit:	fraction
Description:	Leakage Discount Factor
Source of data used:	Taken from assessment of leakage
Value applied:	5%
Justification of the choice of data or description of measurement methods and procedures actually applied :	See B.7 ' Assessment of Leakage'
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

>> The baseline emissions are the total emissions arising from burning fuel wood in the traditional stoves by each households in the project area before installation of fuel efficient stoves. Emissions are calculated based on the methodology in "Type IIG/Version 02. Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" of Appendix B of the simplified modalities and procedures for small scale CDM project activities. As per the methodology, in the absence of project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs.

$ERy = B_{y\ savings} . FNRB_{,y} . NCV_{biomass} . EF_{projected\ fossilfuel}$ (1)

$= By \cdot (1- \eta_{old} / \eta_{new}) \cdot fNRB, y \cdot NCV_{biomass} \cdot EF_{projected\ fossil\ fuel}$

$= 2.7t*(1-0.10/0.2872) *0.807*0.015*71.5tCO_2/TJ$

$= 1.52\ tCO_2$/appliance/year

Where,

ERy	Emission reductions during the year in t CO_2e
$B_{y\ savings}$	Quantity of woody biomass that is saved in tonnes
B_y	Quantity of woody biomass (firewood) consumed by traditional stove in the absence of project activity tonnes/ year
η_{old}	Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction)
η_{new}	Efficiency of the system being deployed as part of the project activity(fraction)
f_{NRBy}	Fraction of non-renewable biomass used by traditional appliances
$NCV_{biomass}$	Net calorific value of non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/ tone

$EF_{projected\ fossilfuel}$ Emission factor for the substitution of non-renewable biomass by similar consumers. The substitution fuel likely to use by similar consumer is taken as Kerosene with the net calorific value as 71.5 TCO_2/TJ.

B.6.4 Summary of the ex-ante estimation of emission reductions:

>> Please refer excel sheet separately provided (ER calculation)

Year	**Estimation of project activity emissions (tCO_2e)**	Estimation of baseline emissions (tCO_2e)	**Estimation of leakage (tCO_2e)**	**Overall emission reductions (tCO2 e)**
2011*	0	8956.40[∞]	447.82	8392.81
2012	0	32215.61	1610.78	30604.83
2013	0	34911.67	1745.58	33166.09
2014	0	34911.67	1745.58	33166.09
2015	0	34911.67	1745.58	33166.09
2016	0	34911.67	1745.58	33166.09
2017	0	25955.27	1297.76	24773.27
2018[+]	0	2561.26	134.80	2561.26
2019	0	0.00	0.00	0.00
2020***	0	0.00	0.00	0.00
Total tCO2e	0	209470.02	10473.50	198996.52
Rounded value	0	-	-	**198994.00**

*Assuming 01/05/2011 as the start of crediting period calculation.

[∞] Yearly sum of *ERm, column L* (ER calculation excel sheet)

+ Normally users replace stoves even without project support after their life time. However, the emission reduction (ER) will be accounted for only if the project extends support to the stove users to replace the appliance for second time after the estimated life time of the first batch of stove replaced, starts to expire from 01 March- 31 March 2017.The age of the last batch of stoves replaced (1080) will expire from 01 May- 31 May 2018.

*** Assuming 31/12/2020 as the end of crediting period.

B.7 Application of a monitoring methodology and description of the monitoring plan:

As per AMS II.G version 02.

- Monitoring shall consist of an annual check of efficiency of all appliances or a representative sample thereof to ensure that they are still operating at the specified efficiency (η_{new}) or replaced

by an equivalent in service appliance. Where replacements are made, monitoring shall also ensure that the efficiency of the new appliances is similar to the appliances being replaced.

- In order to assess the leakages specified, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources). Other data on non-renewable woody biomass use required for leakage assessment shall also be collected.
- Monitoring shall ensure that:
    - Either the replaced low efficiency appliances are disposed off and not used within the boundary or within the region; or
    - If the baseline stoves usage continues, monitoring shall ensure that the wood fuel consumption of those stoves is excluded from B_y, in equation 2.

The CRT/N Project Team together with the local partner organisations (LPOs) in each district implements efficient stove promotion activities in the project area. This project team carries out regular monitoring/home visit for spot checks of the efficient stove installation/sales by the stove technicians, private entrepreneurs and local groups and takes corrective measures as necessary. The Project Manager collects and records user's data both in hard copy and electronic version. The Project Manager forwards the electronic data together with the summary of monitoring reports to the CRT/N central office based in Kathmandu on monthly basis. Project Manager acts as a field CDM monitoring officer. CRT/N Carbon Finance Unit checks all the data and information and ensure compliance with the CDM project monitoring guidelines and will produce annual monitoring report which it will share with Egluro. CRT/N Carbon Finance Unit comprising of a Carbon Analyst and Technical Expert monitors the project activities at the central level and coordinate with the independent third party sample survey to be conducted every year as part of the monitoring.

Assessment of Leakage

a. The project area covers up to 120 Village Development Committees (VDCs) of 6 districts in southern Nepal where biomass is collected from within the reachable fuel collection area and spread over a large area. More than 96%[34] households are using fuel wood in the project villages as access to other renewable energy sources is negligible. Only 12.16% households use biogas for cooking (see Annex3A). Other than biogas, renewable energy sources are not commonly used in the project area. Those households who use biogas will continue to use biogas. At present the households with biogas use fuel wood partially only during winter when there is not sufficient gas produced due to low temperature. Those non-project households who do not install fuel efficient stoves are also at present using non-renewable fuelwood as household energy for cooking. Thus in this scenario, the non-project households shall continue to use same type of biomass and approximately same amount of biomass. Hence non-renewable biomass getting diverted to non-project households who previously used renewable energy sources will be minimum and therefore can be neglected. Nonetheless sample survey shall be conducted every year to monitor the leakage as outlined in paragraph 8 of the monitoring methodology.

Another potential leakage which is space heating (using the fuel wood saved) is negligible because the households in plains in Nepal exhibits the tropical type of climate. The mean temperature in the project area is more than 12^0C during the coldest month (December-January)[35]

[34] Baseline Survey Final Report , October 2009

[35] (http://nepal.saarctourism.org/nepal-weather.html)

and therefore do not heat their houses. Even though the leakage seems negligible, the leakage due to space heating has been calculated below.

b. Need for using non-renewable biomass saved under the project activity to justify the baseline of other CDM project activities is negligible (please refer excel sheet separately provided)and further the demand for fuel wood for household consumption is much higher than the annual sustainable yield. The efficient stoves will be installed only in those households who are using traditional cooking stoves.

c. The project boundary is the kitchens of up to 22920 households in 6 Terai districts in central Nepal using exclusively traditional cooking stoves. They all collect the biomass from the nearest forest which is accessible to them. They collect to fulfil their household need. It is not likely that there will be a sudden change in daily consumption of fuel wood for cooking which will be one of the parameter to monitor during the independent survey.

d. Fuel efficient stoves are installed/sold only when the existing traditional stoves are dismantled/scrapped. The portable fuel efficient stoves which are replaced by new ones needs to be dismantled/scrapped, so that they are neither retained for space heating in the project households nor reused or transfer of the equipment does not take place outside the project boundary during the entire project life. Hence para 9 of the methodology is not relevant. An independent monitoring includes a check of the number of dismantled/ scrapped stove and the stove replaced by the project. Hence there is no possibility of leakage by the transfer of equipment. In the case of portable stove before expiry of lifetime (3 years), if a user no longer wants to use it then this is reported to the stove technician (Promoter) or project team that will transfer the stove to another user in the project area. If the built-in stove is no longer used this will be deducted from the users list and no ER calculation will be made from this abandoned stove.

e. It is very unlikely that the households using biogas to switch over to fuel efficient stoves as biogas stove is cleaner and more convenient to the user compared to the fuel efficient stove. Similarly it is also unlikely that the households using LPG or kerosene will move to fuel efficient stove for the same reason. So the leakage substituting high emission cooking fuel and stove type can be negligible.

f. The transport emissions associated with the installation and fabrication of the fuel efficient stoves is negligible as there is generally no transportation of stoves or the materials by motorized transport. However, the leakage due to possible transportation of stove parts by tractor has been calculated below.

g. In the production process of portable rocket stoves, the ceramic parts are fired up in kilns using the biomass like rice husk and some fuel wood. Rice husk is renewable and also the fuel wood which comes from the regulated market is usually renewable. Therefore, generally the leakage while producing stove parts is negligible.

Calculation of leakage due to space heating and transportation of stove parts

SN	Description	Quantity	Unit	Data source
A.1	**Transportation of ceramic materials**	-	-	-
-	Let us consider:	-	-	-
-	Average distance travelled to transport ceramic materials from manufacturer to LPO office (or any	10	kms	Estimated. Number of manufacturers will be

	depot)			promoted within 10 km radius from the LPO office (sales depot)
	50% of the product manufactured will be transported by tractor from the manufacturer to the LPO office	13200	numbers	Assumed. As different other modes of transportation e.g bicycle and bullock cartS are common in the area
-	If 500 piece per trip shall be transported from the manufacturer to the LPO. Total trip needed will be	26.4	trip	Estimated. A tractor has a capacity to safely carry about 500 ceramic pieces at a time
-	Diesel consumed by the tractor per trip	2	ltr	Average fuel/diesel consumption per round trip
-	Diesel consumed by the tractor in tonnes in 27 round trip (1 ltr = 0.96 kg)	0.10368	tonne	Density of diesel
-	Emission factor of diesel	74.1	tCO2/TJ	IPCC 2006 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (Table 1.4)
-	Calorific value of diesel	0.043	TJ/t	IPCC 2006 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (Table 1.2)
-	total amount of diesel consumed	0.10368	tonne	Calculated
-	**Net emission = amount of diesel * calorific value * emission factor**	**0.33**	**tCO2**	**Calculated**
-	-	-	-	-
A.2	**Space heating during winter**[36]	-	-	-
-	Average fuelwood consumed for space heating	-	-	-
	2674 kg fuelwood consumed per annum, 222 kg consumed per month, so during **1 week** of extreme winter we assume that 52kg of fuelwood is consumed additional for space heating purpose	0.052	tonne	Baseline survey

[36] Space heating may be required in extremely cold winter which may happen in some years but not every year

	from the baseline survey table 3.12, it is seen that 50% of the hh are using traditional stove for space heating purpose so total hh using extra wood for space heating	13200	nos.	Baseline survey
-	Emission factor of wood	112	tCO2/TJ	IPCC 2006 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (Table 1.4)
-	Calorific value of wood	0.015	TJ/t	IPCC 2006 http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (Table 1.2) ; AMS-IIG V02 P.1
-	Net emission reduction = amount of wood * calorific value * emission factor	1153.152	tCO2	Calculated
-	**Net emission for 7 years (assuming extreme winter occurs every year for calculation and also to be conservative)**	**8072.06**	**tCO2**	**calculated**
-	-	-	-	-
-	Total leakage (A.1 + A.2)	**8072.39**	**tCO2**	**calculated**
-	**Total leakage in the project**	**4.06**	**%**	**Calculated (A1+A2)/total ERs times 100**

Conclusion

Thus as mentioned above, there is no possibility of: (i) use or diversion of non renewable woody biomass saved by the project activity by non-project households. (ii) Use of non-renewable woody biomass saved under the project activity to justify the baseline of other cdm project activity (iii) Increase in the use of non renewable biomass to create non renewable biomass baselines and (iv) transfer of the stoves currently used in the project to other non project households.

However any rare cases of leakages arising due to uncertainties as: few households using some firewood for space heating in exceptionally colder winter days and use of tractor for transportation of stove materials in some districts have been taken into account. Accordingly, the leakage is 4.06%. Thus, 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. This 5% discount factor will obviously make the emission reduction calculation even more conservative. However, the actual leakage will be assessed from the periodic sample survey by independent third party for the increased use of non renewable woody biomass in non-project households and this monitored value shall be used for leakage and subsequently for the emission reductions calculations.

B.7.1 Data and parameters monitored:	
Data / Parameter:	V_n
Data unit:	Number
Description:	Project villages/ village development committee (VDC)
Source of data to be used:	VDCs mentioned in the users data form; District map
Value of data	Max. 120
Description of measurement methods and procedures to be applied:	Project area will be highlighted in the district map
QA/QC procedures to be applied:	VDC wise fuel efficient stove installation/sales data will be maintained.
Any comment:	The number of VDCs where fuel efficient stoves to be disseminated will be up to 20 in each district.

Data / Parameter:	D_n
Data unit:	Number and type
Description:	Type of stove displaced/dismantled
Source of data to be used:	Monthly efficient stove installation/sales data reported by the promoter and LPO through technical officer and Project Manager.
Value of data	Max. 22920
Description of measurement methods and procedures to be applied:	The information on the number for respective type of the stoves dismantled at the user household will be recorded by the promoter in their database during installation/sale of stoves. 68 households will be sampled during the survey by third party consultant.
QA/QC procedures to be applied:	The data will be randomly checked by independent third party consultant during annual sample survey as part of monitoring.
Any comment:	--

Data / Parameter:	N_y
Data unit:	Number
Description:	Total number of efficient operational stoves.
Source of data to be used:	Monthly efficient stove installation/sales data reported by the promoter and LPO through technical officer and Project Manager.
Value of data	Up to 22920 by the end of third year of project implementation.
Description of measurement methods and procedures to be applied:	Each stove installed/sold is recorded in a stove user data form with serial no, user's name, address, date stove installed/sold including the name of the stove installer or person/ institution selling the stove and the amount of direct subsidy. This form is signed by the stove user to transfer the emission reduction ownership to CRT/N. Altogether 50% of the efficient stove installed/sold are spot checked by the project and partner staff to ensure the quality and proper use and if necessary corrective measures are taken during the visit. A copy of the stove user/ER transfer slip is kept in the district support unit while the original is forwarded to the Project Manager. The data on stove installation/sales received

	from the Promoters as well as those obtained during field monitoring visit/spot checks by district support unit and partner staff is forwarded to the Project Manager who will transfer the data to the electronic data base. The Project Manager makes spot checks of 10% of the stoves and will take appropriate corrective actions for any inconsistencies.
QA/QC procedures to be applied:	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.
Any comment:	The serial number of stove will be marked on each of the stove installed/ sold.

Data / Parameter:	η_{new}
Data unit:	% heat utilized
Description:	Efficiency of the Fuel Efficient appliance replaced
Source of data to be used:	Water Boiling Test for each year of operational stove
Value of data	0.2872
Description of measurement methods and procedures to be applied:	Based on users preferences two types of efficient stoves are to be promoted. Water boiling test is carried out every year for 68 sampled households using the standard testing protocol developed by University of California, Berkeley and The shell Foundation. After one year, a one year old stove will be tested whereas after two years a one year and a two year old stove will be tested. The value obtained from the test will be used to calculate the emission reductions of the systems for that year of operation.
QA/QC procedures to be applied:	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.
Any comment:	The ex post monitored value of efficiency shall be used for ex post emission reduction calculation.

Data / Parameter:	Stove Emissions (CO and $PM_{2.5}$)
Data unit:	ppm and $\mu g/m^3$
Description:	Carbon Monoxide (CO) and fine particulate matter ($PM_{2.5}$) emission from burning the fuel wood in fuel efficient stoves.
Source of data to be used:	Field measurement of the emissions for existing traditional stoves and Fuel efficient stoves by project team
Value of data	Ex post monitored value.
Description of	CRT/N project team will measure the comparative emissions of Carbon Monoxide

measurement methods and procedures to be applied:	(CO) and particulate matter $PM_{2.5}$ of traditional stove user-households and efficient stove user households in each project district every six months during winter and summer season as part of regular monitoring activity for 68 households (see sample size in sample plan Annex 3F).
QA/QC procedures to be applied:	The measurement will be taken by using standard instruments used to measure indoor air pollution in rural areas like the UCB PM Monitor[37] and Hobo CO monitor or the equivalent instrument available following the standard guidelines from the manufacturers.
Any comment:	--

Data / Parameter:	U_Y
Data 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.
Source of data to be used:	Sample survey
Value of data	Usually above 95%
Description of measurement methods and procedures to be applied:	A total of 68 households will be surveyed during the sample survey, % of user households who did not use the stove more than three months will be identified. The % figure will be used to adjust the stove-year of all the stoves so far disseminated.
QA/QC procedures to be applied:	The survey will be done by third party consultant every year.
Any comment:	--

Data / Parameter:	t_Y
Data unit:	Months
Description:	Operation time of the fuel efficient stoves
Source of data to be used:	CRT/N data base records; sample survey
Value of data	Ex post monitored value.
Description of measurement methods and procedures to be applied:	The portable type of stove starts to generate emission reduction once it is sold and the user sign the data form however the fixed model generates emission reduction only after a week of installation once it is completely dry and becomes fully operational. Therefore, for simplicity and to be reasonably conservative, emission reduction is calculated only from the following month for any stove installed or sold in that particular month. 68 households will be sampled during the sample survey, the number of months a stove was in operation in the past year will be estimated. Since a stove in operation for 12 months completes one stove-year, the fraction of stove year will be estimated if the operational month is different than 12 months.

[37] PM monitor developed by University of California, Berkeley for rural households where particle levels are above 50 µg/m3.

QA/QC procedures to be applied:	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 will cross check the database entries and take corrective measures for any errors. Egluro will suggest on appropriate corrective measures if needed.
Any comment:	--

Data / Parameter:	L_y
Data unit:	Tonnes/year
Description:	Quantity of woody biomass used by non user households (in tonnes)
Source of data to be used:	Sample survey
Value of data	Ex post monitored value.
Description of measurement methods and procedures to be applied:	Sample survey will be conducted by independent third party on periodic basis to determine the quantity of woody biomass used by non user households. The value will be compared with the baseline data of 2.7 tonnes per year per household. If the values are statistically different, adjustment will be made in leakage calculation.
QA/QC procedures to be applied:	Qualified third party will be hired to conduct the survey independently.
Any comment:	--

Data / Parameter:	P_n
Data 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.
Source of data to be used:	Training reports which are generated after every training event
Value of data	Ex post monitored value.
Description of measurement methods and procedures to be applied:	Participants list provides number of people trained.
QA/QC procedures to be applied:	The ICS promoters to be trained will be selected by local communities in close coordination with LPO/project staff and following a selection guideline.
Any comment:	In each VDC, 4 ICS promoters will be trained. Additional persons might be trained if there is significant drop-out.

Data / Parameter:	T_n
Data 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.
Source of data to be used:	Training reports
Value of data	Ex post monitored value.
Description of measurement methods and procedures to be applied:	Training reports
QA/QC procedures to be applied:	The training will be conducted following standard procedures and guidelines developed by CRT/N and other concerned agencies.
Any comment:	--

B.7.2 Description of the monitoring plan:

>> 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 will be managed by the project implementer Centre for Rural Technology, Nepal (CRT/N).

The project implementation will start in October 2010 after setting up of the Project Team. This will be done immediately after the validation process. The Project Team will identify local partner organisations (LPOs) in project implementation with more involvement in social mobilization. Together with the LPOs, the Technical Officer (TO) will identify and train stove builders (promoters) for the fixed type of stove. In the mean time, the TO together with LPOs identify manufacturer and retailers for the portable stove. Thus stove dissemination will kick off after the training of promoters and identification of fabricators of portable stoves. The trained promoters would then install 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 will be initially trained by the project team for quality assurance of the product. The stoves should be distributed only from authorized and trained workshops.

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 will have monitoring plan implemented in full fledges immediately after the stoves starts getting 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 will use installation data format and will be substantiated by ER transfer slip signed by the users. They will also report on selling of portable type stoves on the basis of purchase slip they have provided to potential buyers. However, the actual sales data of portable type stoves comes from the retailers as they claim for reimbursement of subsidy amount each month.

The LPO staff and Technical Officer will verify the data and compile monthly installation data which will be 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/scrapping 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 unique10-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 will be 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 will be 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 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 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.

Efficiency tests, equipments and measurements

The efficiency tests of stoves will be done every year to determine mean efficiency of the stoves in use. Technical testing will be 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 the UCB and HOBO equipments need calibration, they will be sent to the manufacturer.

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.[38]

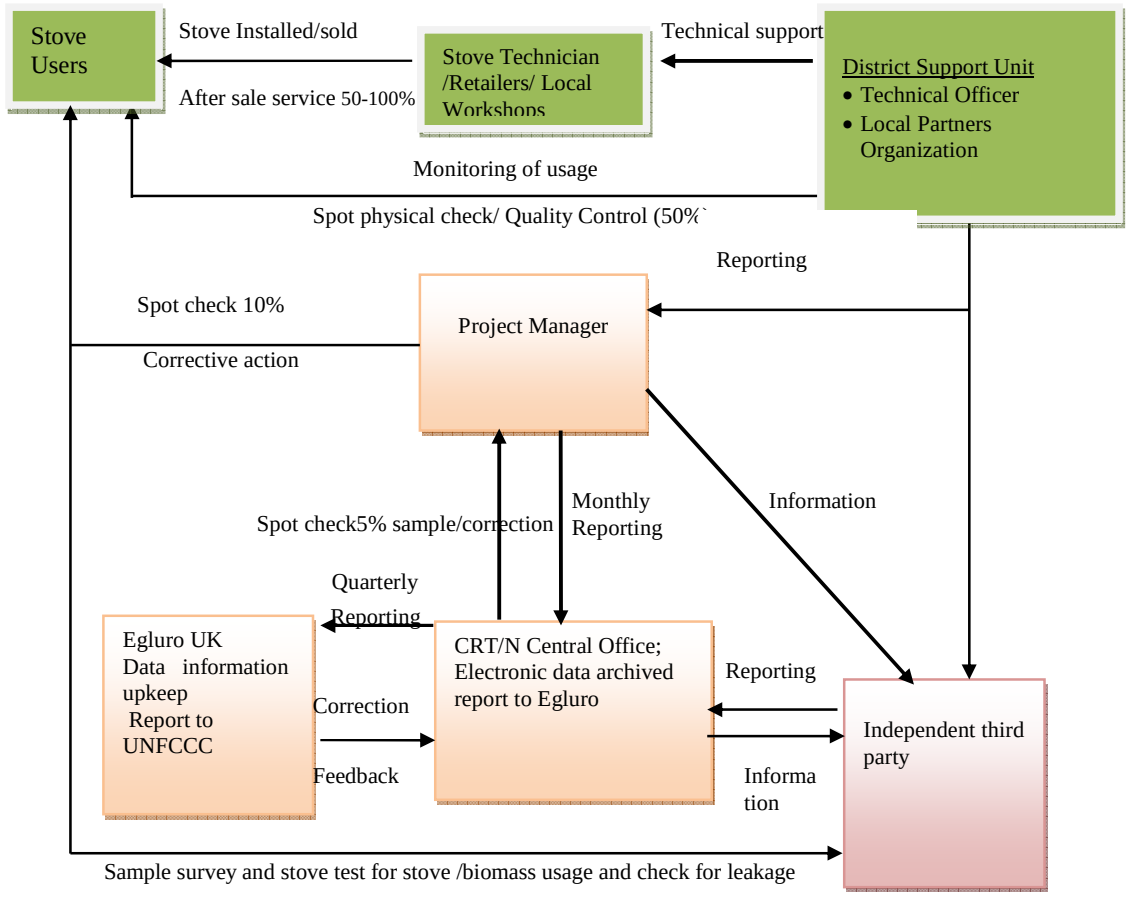
CRT/N produces quarterly report and annual monitoring report and submits to Egluro. Egluro assists CRT/N in implementation and monitoring of the project and coordinates with Designated Operational Entity (DOE) and the UNFCCC.

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 will be as follows:

[38] Please refer Annex 3G for sampling plan

Fig: IV



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

>> The baseline study and monitoring methodology was completed in June 30, 2009 and was revised in late November 2009. Key persons involved in are Subarna Kapali from Centre for Rural Technology, Nepal and Rajan Thapa, Kieron Robinson from Egluro, UK.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>> 01/10/2010. Preparatory activities e.g identification of potential local partners, information material design and printing, field-units establishment, identification and training of fuel efficient stove builders (promoters) and identification of fabricators for stove parts have been undertaken till date. The material supply agreement has not been signed with any supplier.

C.1.2. Expected operational lifetime of the project activity:

>> 10 years fixed

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>> N/A

C.2.1.2. Length of the first crediting period:

>> N/A

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>> 01/05/2011 or date of registration whichever is later

C.2.2.2. Length:

>> 10 years

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>> There will not be any adverse environmental impacts as a result of the project activity. The efficient stoves basically use sun dried clay bricks, rice husk, rice husk ash and few pieces of iron rods and some aluminium sheet. Except the iron rods and aluminium sheet, all the materials used for stove are locally available in most of the places. Further, the clay, sun dried bricks and iron rods can be reused when the stoves require replacement. Additionally, according to the local stakeholders the project helps in reducing indoor air pollution, reduce use of dung cakes as fuel which can be used as a fertilizer and save fuel wood thus reducing pressure on forests and reducing green house gas emissions thus having positive environmental impacts. Besides, the project also increases awareness among the rural people on the local and global impacts of green house gas emissions. Thus, the project activity has no negative environmental impacts.

Apart from this an approval of the PIN has been granted by the Ministry of Environment, Science and Technology which also is the focal ministry for EIA issues. Furthermore, as per Environment Protection Regulation (EPR 1997 Schedule 1 and Schedule 2) the Improved Cooking Stove project is not enlisted in the project category requiring Environmental Impact Assessment (EIA).

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>> As per Schedule 1 and Schedule 2 of Environment Protection Regulation of government of Nepal (EPR 1997) the Improved Cooking Stove project is not enlisted in the project category requiring Environmental Impact Assessment (EIA)[39]. .

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>> **Local Stakeholder's Meeting:**

The Local Level Stakeholders' Meeting was conducted on 2nd August 2009 at Birgunj Municipality, Parsa District. A total of 36 individuals including 6 female participants from various government organizations, non government organizations, private sectors, local residents, health sector, forest users groups and other organisations affected by the project including media persons participated during the meeting.

The participants were invited from different relevant organizations of six project districts. The participants were invited through post and emails. They were identified based on prior information available at CRT/N and also by coordinating with two of the local active NGOs: Rural Region and Agro-forestry Development Centre (RRAFDC) and Nepal Biogas Promoters Association based in Bara and Rautahat districts respectively. The targeted participants of the meeting were the local people impacted by the project, local policy makers and representatives of local authorities. Among them official representatives of non-government organizations (NGOs) and local line agencies who have been working on rural energy (like cook stoves, biogas, micro hydro, agriculture extension), gender, environment related programs relevant to the project were also invited. Besides, reporters from national daily newspaper and the local newspaper were also invited in the meeting. The meeting was held in Nepali language which is common language understood by all the participants.

Central Level Stakeholders Meeting:

In addition to the local level stakeholders' meeting, a second consultation meeting was also organized at central level on 8 September 2009 in Kathmandu. A total of 23 participants including 4 females from central level policy makers, representatives of central authorities, government and non-government organizations, Gold Standard Supporter non government organizations, media persons participated in the central level meeting. The meeting aimed to share the outcomes of the local stakeholder consultation meeting, discuss the social and environmental impacts of the project at local level and also discuss on the draft Project Design Document (PDD) of the project for further improvements.

39

http://74.125.153.132/search?q=cache:LskTBWi4NTAJ:www.nea.org.np/reports/EIA%2520SIA%2520Framework%2520for%2520Additional%2520IDA%2520Financing%2520Draft.pdf+Environment+Protection+Rules+1997+of+Nepal+ammended+in+1999,+Schedule+1+and+2&cd=9&hl=ne&ct=clnk&gl=np(Annex 2 page 81)

The stakeholders meeting participants expressed that the meeting provided adequate information about the project and there is a need of this kind of improved cooking stove project.

The participants expressed their full support and commitment for the project. The meeting also acknowledged that the project will not only help in reducing GHG but also improve the health of women and children by improving indoor air quality of the rural households. Besides the efficient stove project will improve the environmental degradation by reducing demand for firewood. The meeting was held in English language so that the deliberations were understood by all the participants. There were also participants representing donor organisations.

E.2. Summary of the comments received:

- >> The selection of VDC for project area should be done prior to the initiation of the project. The project should determine whether the project would be feasible only towards north direction of highway where the forests are depleting or south where there is no forest at all. So, it would be better if the project VDCs will be concentrated towards north of highway for saving forest where almost all of the household use fuel wood as source of cooking energy. However, it is also important to have a project along with appropriate cooking devices in the south of the district as access to fuel wood has been rather difficult and people are using dung cakes and low grade fuel for cooking.
- Village Development Committee (VDC) selection in the program district should be done in close coordination at the district level
- Awareness raising activities should be done at the VDC level
- Local languages like Bhojpuri and Maithili should be used during publicity campaign.
- All the existing available information should be used and the methodology should be strong so that it will be useful for future projects.
- Social equity should also be considered, which is pretty valuable in Terai.
- These types of related stakeholders meetings should be organized frequently for interactions, feedbacks, suggestions and sharing.
- More time should be allocated for discussion during these types of meeting
- District level meetings should also be organized
- Coordination should be done with government and non-government organization for project implementation.
- Advertisement, orientation, awareness about the technology and programme activities should be done focusing at field level.
- Monitoring system at different levels should be clarified
- Apart from the implementation side, self monitoring from the users side should also be included in the project.
- Indoor air pollution and health related topics will be more effective in this type of project.
  Besides there were questions/comments regarding the coordination mechanism, carbon revenue, total project cost, selection criteria of local partner organisation for project implementation, maintaining quality of stoves, amount of subsidy, equity and extra benefits for poorer households.
- The technology should also be allowed to disseminate in other places outside the project area.

E.3. Report on how due account was taken of any comments received:

- >> Project areas (VDCs) have already been selected based on the selection criteria. Accordingly, the chosen VDCs are located along the east-west highway as most of the forest exists along the highway. Those VDCs with considerable forest coverage area and nearby VDCs that are dependent upon the same forest and where fuel wood consumption is high have been selected. As use of ICS could reduce quantity of fuel wood consumption having significant impact on the forest resource. VDCs far away from the forests and where use of firewood is very low have not been included in the project areas as the fuel efficient stoves to be promoted in the proposed project VDCs may not be appropriate for those VDCs which uses dung cake for cooking.
- Although it was the requirement of the project to select those VDCs mainly in the north of the district where fuel wood is the main source of household energy however, the project would be implemented in close coordination with the local government and non-government organisations. There will be a village advisory committee (VAC) formed at local level representing various local organisations to help in smooth implementation of the project.
- Various activities like orientation and demonstration, trainings, exhibitions, posters, pamphlets, etc shall be carried out for effective promotion, dissemination and awareness creation among the communities. There will be promotional materials in local language. All the activities are geared toward creating effective demand for fuel efficient stoves and these activities are carried out by the local partner organisations therefore these methodologies will be replicable in future projects.
- The project will provide direct subsidy to make the stove affordable even for the poorer households. There are two models of stoves to be disseminated: built in models and the portable ones. The built in model are cheaper and the users have choice to select this cheaper models, if they cannot afford the portable ones. Apart from this there are community forest groups which have some fund available in their bank account and the community can approach this group fund to help the ultra poor household in the community to buy a fuel efficient stove.
- The project has provision for Project Initiation Workshop in-built in the project which is also like the stakeholders meeting and there will be a review workshop where in users can put their concern, issues and suggestion for improvements in the project.
- The carbon revenue is sufficient to implement the project and carry out the monitoring activities throughout the crediting period.
- The project has a different level of monitoring in built which ensures the quality of the fuel stove devices to be installed and sold. There is after sale service and spot checks from the stove builders project staffs, partner staffs, Project Manager and central level staffs from the Implementing organisation. Besides there is a provision for a representative sample survey every year by independent consultant.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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 5537556
FAX:	+977 1 5008537
E-Mail:	info@crtnepal.org
URL:	www.crtnepal.org
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
Direct FAX:	+977 1 5008537
Direct tel:	+977 1 5537556/5008536
Personal E-Mail:	ganesh@crtnepal.org

Organization:	Egluro.
Street/P.O.Box:	24 Old Jamaica Road
Building:	Unit 27&28
City:	London
State/Region:	London
Postfix/ZIP:	SE16 4AW
Country:	UK
Telephone:	+44 8445 717 313
FAX:	N/A
E-Mail:	kieron@egluro.com ; Lee@egluro.co.uk
URL:	N/A
Represented by:	Kieron Robinson
Title:	Director
Salutation:	Mr.
Last Name:	Robinson
Middle Name:	Hugh
First Name:	Kieron

Department:	N/A
Mobile:	+44 7926171664
Direct FAX:	N/A
Direct tel:	+44 8445 717 313
Personal E-Mail:	khrttf@fsmail.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the project. Alternative Energy Promotion Centre (AEPC) will provide policy guidance and coordination support for the project as a government focal agency for promoting renewable energy technologies in Nepal.

EGLURO

Units 27 & 28
24 Old Jamaica Road
Bermondsey
London
SE16 4AW

Tel 08445 717313
Email kieron@egluro.com

10 January 2011

Project reference:
'Efficient Fuel Wood Cooking Stoves Project in Foothills and Plains of Central Region of Nepal

TO WHOM IT MAY CONCERN

Declaration of Non-Use of Official Development Assistance by Project Proponent

I confirm that no financing provided in connection with the above named project has come from or will come from Official Development Assistance.
The project will be implemented with exclusive funding support from private financial investors who will recoup their project funding through the CDM mechanism via CERs generated by the project.

If I learn or if I am given any reason to believe at any stage of project design or implementation that ODA has been used to support the development or implementation of the project, or that an entity providing ODA to the host country may at some oint in the future benefit directly or indirectly from the credits generated from the project as a condition of investment, I will make this known to the bodies concerned immediately.

Signed:

Name: Kieron Robinson

Position: Director

ग्रामीण प्रविधि केन्द्र
Centre for Rural Technology, Nepal
(संस्था ऐन, २०२४ अन्तर्गत दर्ता)

Date: 18 May 2010

Project reference: 'Efficient Fuel Wood Cooking Stoves Project in Foothills and Plains of Central Region of Nepal'

TO WHOM IT MAY CONCERN:

Declaration of Non-Use of Official Development Assistance by Project Proponent

I now expressly declare that no financing provided in connection with the above-referenced project has come from or will come from ODA. The project will be implemented with exclusive funding support from financiers, which will recover the project funding through CDM finance later after CERs are generated from the project.

If I learn or if I am given any reasón to believe at any stage of project design or implementation that ODA has been used to support the development or implementation of the project, or that an entity providing ODA to the host country may at some point in the future benefit directly or indirectly from the credits generated from the project as a condition of investment, I will make this known to the concerned bodies immediately.

Signed:

Name: Ganesh Ram Shrestha

Title: Executive Director

रजिष्टर्ड कार्यालयः त्रिपुरेश्वर, काठमाडौं, नेपाल ।
जि.पि.ओ. बक्स नं. ३६२८, कुमारीपाटी, ललितपुर, नेपाल । टेलिफोन नं. ५००८५३६, ५००८५३८, ५५३७५५६, फ्याक्स १७७-१-५००८५३७
G.P.O. Box No. 3628, Kumaripati, Lalitpur, Nepal. Telephone No. 5008536, 5008538, 5537556, Fax: 977-1-5008537
Email: info@crtnepal.org; URL: www.crtnepal.org

Annex 3A

BASELINE INFORMATION

Baseline Survey Final Report, October 2009

This baseline study as the title indicates is conducted to gather baseline information required for development of a CDM project on improved cooking stoves in the mid Terai. The specific objectives were to: (i) Collect data on biomass production from the forest and establish proportion of non-renewable biomass being used by the local people, (ii) Collect data and estimate quantity of fuel wood and other fuels consumed annually by the rural people, (iii) Collect information on appliances in use for cooking, heating, animal feed cooking, etc. and related socio-cultural practices, (iv) Collect other background data relating to demographic, economic, health, gender aspects, etc.

The study involved both primary and secondary data collection. As mentioned earlier, the majority of information relevant to this study was collected from the baseline survey questionnaire and interviews with other concerned stakeholders.

The study districts included six districts of Central Development Region of Nepal. They were Parsa, Bara, Rautahat, Sarlahi, Mahottari and Dhanusa. Four sample VDCs were chosen from each district, and 20 sample households from each VDCs, making a total sample of 480 households.

The survey revealed a total population of 3540 members from 477 households indicating an average family size of 7.42. The male to female ratio came out to be 1.02. The proportion of children from five years below was 12.57 percent. The population share of economically active people i.e. 15 to 59 years of age was 54.54 percent.

The data also showed that there was an illiterate population of 17.2 percent in overall sampled population. The portion of population who could just read and write is 35.2 percent. Similarly, populations who were educated up to 10th grade were 20.5 percent and that of SLC and above constituted 27.1 percent. The data shows more or less similar pattern of education status across the different districts. It was evident that the female had lesser education performance than male in all districts.

The data on the status of occupation for the surveyed households revealed that agriculture constitutes as the prime occupation of 74 percent of the sample households. Likewise, wage-earners, businessmen and salaried persons were 15.3, 6.08 and 2.1 percent.

The obtained information through the questionnaire survey revealed that the order of disease occurrence in terms of severity were firstly the headache then the order was cough, eye disease, chest disease, throat disease, respiratory disease, so on. Incidents related with fire were also conspicuous. The data also revealed that women suffered more from different diseases as compared to men.

Traditional mud stove has been the prominent and mostly used stove invariably for cooking purpose. Also this type of stove was the one used mostly for preparing kundo (animal feed), water heating and space heating purposes among the surveyed households. So, it is evident that burning of firewood was the prime source of energy for majority of household cooking needs.

The survey presents the details about the energy resource uses by the surveyed households. It was found that about 96.44 percent of the surveyed households used firewood for cooking foods in varying degree. Average firewood consumption for this activity came out to be 2674 kg per annum. Similarly, about 58.49 percent of the surveyed households have reported using firewood for preparing animal feed (kundo). The average monthly firewood consumption for cattle feed came out to be 1383.32 kg per annum. Likewise, about 27.67 percent were found using firewood for other activities such as alcohol preparation, heating water, other food processing activities, etc. The average firewood consumption was 548.05 kg per annum for such activities.

About 7.76 percent were found using agriculture residue for cooking and the average annual quantity was 100.25 kg. About 6.71 percent were found using Jhikra (twigs, branches and leaves from forest) for cooking. The average annual quantity consumed was 50.31 kg. About 17.61 percent were found using cow dung cake for burning and average monthly quantity came out to be 130.87 kg.

Among 477 households survey, 58 households were found to use biogas plant for cooking which was about 12.16 percent of the surveyed household population. Some 4.61 percent of the households were found using kerosene for cooking. The average kerosene consumption was 9.89 litres per year. Some 6.71 percent of the households were using LP Gas for cooking. The average gas consumption was 1.55 cylinders per year. Some 7.55 percent of the households were using electricity for cooking. They consumed on an average 9.43 units per annum.

In general, it is apparent that VDCs located near forest areas used firewood profusely for cooking as well as for other activities. It is also evident that the majority of population used firewood especially for cooking even in those VDCs which are comparatively farther from the forest areas. They relied on purchased firewood up to great extent for that matter. Also, perhaps due to reasons of unreliable supply and increased price of firewood, they were increasingly motivated to seek for other alternative energy sources such as biogas, LP gas, and electrical appliances as much as possible. In this context, the concept of improved cooking stoves with the promise of saving firewood consumption seemed to be a welcome idea for them.

The data obtained from the baseline survey showed that the majority of households obtained firewood from multiple sources. It was calculated out that some 50.7 % of the users collected firewood from community forests and while some 68.8 % of users collected firewood from government forests. While some 13 % and 24.9 % percent of users used private forests/lands and other sources respectively. The ‘others’ here meant the firewood that was bought and others collected from elsewhere.

The data revealed that users collected some 28.11 percentage of their requirement from community forests while 47.17 percentage of firewood quantity from the government forests. It is also evident that the firewood collected from community forests and government forests varied greatly across the different districts. To elaborate it further, the exploitation of community forests and government forests were almost similar in Parsa. In Bara and Rautahat districts, government forests were much more approached for firewood in comparison. In Sarlahi, the supply of firewood was more from community forests as compared to government forest, but there was considerable supply from vendors. But, in Mahottari, the supply was much from government forests as well as from vendors. The overall scenario showed that the government forests were much more exploited for collection of firewood as compared to community forest and other sources.

The responses regarding the question of effect of firewood collection of the condition of forest were found to be very inconsistent across the different districts. For example, the respondents in Bara district chose to say that the forest were degraded due to firewood collection, while the majority of respondents in Parsa were indecisive in this matter but about 29.5 percent expressed the view that firewood collection have reduced the forest lands. In Mahottari, the respondents have reported that the firewood collection has greatly reduced the forest lands. In general, nearly half of the total respondents seemed to voice that the firewood collection has reduced the size of forest lands while another half of respondents were voicing that firewood collection has degraded the forest lands.

The survey results showed that the respondents saw stealing and selling of firewood to be most notorious practice that has been degrading the forest. Other contributing factors were (i) illegal cutting of trees for timber (ii) collection of firewood by communities and (iii) felling of trees by communities for timber. So, the overall scenario from the perspective of the respondents is such that the degradation of forest has been due to the over extraction of firewood and felling of trees through legally permitted communities as well as through unauthorized activities of certain individuals or groups.

The survey indicated that the users were required to devote more time and effort to collect firewood from the forest with the passing of the time. Data analysis revealed that the average time needed was 1.46 hours in 1989. While in 2000, it was 2.43 hours and in this year of survey i.e. 2009 it was 4.12 hours.
The survey result showed that the users were required to travel more distance with the passing of the time. In 1989, it was 2.01 km, and in 2000, it was 2.64 and during the time of survey this year (2009) it was 3.72.

In response to another query as to what distances the users have to travel, it was found majority (83.65 %) have to travel a distance more than 2 km.

It showed that the price of firewood had increased over the time. The increase from time span of 2000 to 2009 was even more as compared to that from 1989 to 2000. The price rise could be due to situation of scarcity of firewood.

The survey result showed that the use of low grade firewood and use of agriculture residue, etc has increased with the passage of time. Only 3.6 percent respondents have reported using jhikra (twigs, branches and leaves) since old time i.e. 1989 and before. While some 19.3 percent respondents reported using jhikra from 2000 onwards. About 77.4 percent respondents reported using jhikra currently for different cooking purposes. This situation indicates the growing scarcity of firewood as well as increased price of firewood over the time.

Calculation about the firewood consumption for cooking foods, kundo preparation and others shows an annual requirement of 4605 kg per household from this survey. (From the survey results - 2674 kg for cooking foods, 1383 kg for kundo and 548 kg for others = 4605 kg per year per household).

Considering a forest growth rate of 1.2 m3/ha/year (as per WECS[40] Report, 2006) and a wood density of 870, there is a need to maintain a forest of 4.41 ha for each household in order to have a sustainable supply of firewood at the rate of 4605 kg per year.

[40] Water and Energy Commission Secretariat of Government of Nepal

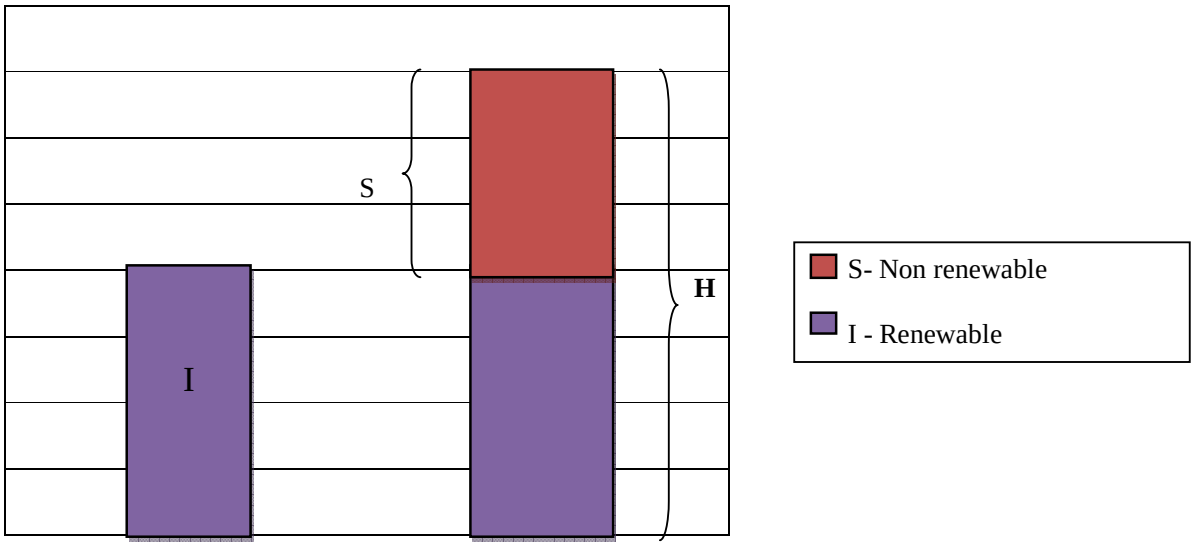
Annex 3B

Calculation of Fraction of Non renewable Biomass

Activity		Quantity	Unit	Remarks
Step 1: Identification of Woody Biomass Production Area	-	-	-	-
Woody Biomass Forest Area	A	180392	ha	The total forest area in 6 districts excluding protected area has been taken as the total reachable forest for the households and settlements of the project area. (Source: Forest Cover Change Analysis of the Terai District (1990/91 - 2000/01), Department of Forest, May 2005, Table 1, p. 6
Step 2: Estimation of Demonstrably Renewable Biomass (DRB)	-	-	-	-
Mean Annual Increment	B	1.2	m^3/ha/year	The average annual increment of the government managed forests in Nepal is 1.2 m3/ha/year (Annex 3G)
Annual Increment	C = B * A	216470	m3/year	-
Density of Fuel Wood	D	0.87	tonnes/m3	Density of fuel wood for Terai is 0.87 (Source: Forest Resources of Nepal (1987-1998)
Average Annual Wood Fuel Increment of the total forest in district (**DRB**)	I = C * D	188329	tonnes/year	-
Step 3: The Average Harvest of Wood Fuel from Area A	-	-	-	-
Average Number of Households Residing in Area A	J	188291	households	Households of 120 VDCs only (Nepal Census Data 2001)
Timber and Industrial Consumption per Household	K	0.58782	tonnes/year/household	Source: Master Plan for the Forestry Sector Nepal:
Household Wood Consumption	L	4.6	tonnes/year/household	Baseline Survey Final Report, October 2009 (Conducted by APTEC Consultancy for Egluro-UK/

				CRT-N joint CDM Project)
Total Timber and Industrial Harvest	M = K * J	110681	tonnes/year	-
Total Fuel Wood Consumption	N = L * J	866139	tonnes/year	-
Total Harvest of Wood From entire forest in the district Area A	H = M + N	976820	tonnes/year	-
Step 4: The Shortage of Woody Biomass in the Area	S	-	-	-
Shortage of Woody Biomass (**Non Renewable Biomass**)	S = H - I	788491	tonnes/year	-
NRB saved by registered biogas plants	W	2060.1	tonnes/year	Adjusted $F(NRB)_Y$ calculation excel sheet
Net Shortage of Woody Biomass in the Area	S'= S-W	786430.9	tonnes/year	-
Step 5: The amount of Woody Biomass in the Project	-	-	-	-
Number of Households	G	30600	households	Beneficiary households
The Amount of Woody Biomass consumption in the Project	O = G * L	140760	tonnes/year	-
The share of non-renewable biomass is	$F_{(NRB)y}$ =S'/(S' + I)	0.807	-	-

Fig: 2 Overview of Definition



Annex 3C

Fuel Efficient Cooking Stoves Test Result

KATHMANDU UNIVERSITY
SCHOOL OF ENGINEERING
Department of Mechanical Engineering
Dhulikhel, P.O. Box 6250, Kathmandu, Nepal
Tel: (011) 661399, 661511, Fax: 977-11-661443, e-mail: mec@ku.edu.np

The result of the water boiling test conducted at CRT/N lab by the researchers of this department for the fuel efficient stoves (Two Pothole ICS) to be disseminated in the proposed carbon project areas are as follows:

Stove type/model	**Two pot hole ICS**
Location	CRT/N Lab
Wood species	Average Hardwood
Weight of water in first pot	5 liters
Weight of water in second pot	5 liters
Wind conditions	Light breeze
Date of test performed	17th sep 2009

1. HIGH POWER TEST (COLD START)	units	Test 1	Test 2	Test 3	Average	St Dev	COV
Time to boil Pot # 1	min	29	29	29	29.2	0.0	0%
Temp-corrected time to boil Pot # 1	min	31	32	32	31.6	0.7	2%
Burning rate	g/min	15	15	16	15.4	0.6	5%
Thermal efficiency	%	**30.9%**	**31.04%**	**31.4%**	**31.1%**	**0.3%**	**0.8%**
Specific fuel consumption	g/liter	76	76	80	77.4	2.3	3%
Temp-corrected specific consumption	g/liter	80	83	88	83.9	4.1	5%
Firepower	watts	4,624	4,555	5,010	4730	245.1	5%

2. HIGH POWER TEST (HOT START)	units	Test 1	Test 2	Test 3	Average	St Dev	COV
Time to boil Pot # 1	min	19	19	19	19.4	0.0	5E-15
Temp-corrected time to boil Pot # 1	min	21	21	22	21.4	0.3	1%
Burning rate	g/min	21	23	21	21.4	1.0	5%
Thermal efficiency	%	**33.23%**	**30.6%**	**33.5%**	**32.4%**	**1.6%**	**4.82%**
Specific fuel consumption	g/liter	71	76	69	71.8	3.3	5%
Temp-corrected specific consumption	g/liter	77	82	77	78.8	2.9	4%
Firepower	watts	6,338	6,907	6,436	6560	304.5	5%

Stove Tested By: Er.Nishant Gautam and
Shiva Hari Koirala
Designation: Research Officer
Dept. of Mechanical Engineering

Verified By: Dr. Bim Prasad Shrestha
Designation: Head Of Department
Dept. of Mechanical Engineering

KATHMANDU UNIVERSITY
SCHOOL OF ENGINEERING
Department of Mechanical Engineering
Dhulikhel, P.O. Box 6250, Kathmandu, Nepal
Tel: (011) 661399, 661511, Fax: 977-11-661443, e-mail: mec@ku.edu.np

The result of the water boiling test conducted at CRT/N lab by the researchers of this department for the fuel efficient stoves (Rocket Stove) to be disseminated in the proposed carbon project areas are as follows:

Stove type/model	**Rocket Stove**
Location	CRT/N Lab
Wood species	Average Hardwood
Weight of water in first pot	5 liters
Wind conditions	Light breeze
Date of test performed	20th sep 2009

1. HIGH POWER TEST (COLD START)	units	Test 1	Test 2	Test 3	Average	St Dev	COV
Time to boil Pot # 1	min	39	39	34	37.3	2.8	8%
Temp-corrected time to boil Pot # 1	min	43	42	38	41.1	3.1	7%
Burning rate	g/min	10	9	11	10	0.9	9%
Thermal efficiency	%	**28.7%**	**29.1%**	**28.9%**	**28.9%**	**0.2%**	**0.6%**
Specific fuel consumption	g/liter	77	75	78	76.7	1.7	2%
Temp-corrected specific consumption	g/liter	86	81	86	84.5	2.8	3%
Firepower	watts	3,013	2,828	3,349	3063	264.5	9%

2. HIGH POWER TEST (HOT START)	units	Test 1	Test 2	Test 3	Average	St Dev	COV
Time to boil Pot # 1	min	29	34	29	30.8	2.8	0.0912
Temp-corrected time to boil Pot # 1	min	33	38	32	34.2	3.1	9%
Burning rate	g/min	13	10	12	11.4	1.4	12%
Thermal efficiency	%	**29.7%**	**30.4%**	**30%**	**30.1%**	**0.4%**	**1.2%**
Specific fuel consumption	g/liter	78	71	70	73.1	4.4	6%
Temp-corrected specific consumption	g/liter	87	79	78	81.2	5.2	6%
Firepower	watts	3,887	3,056	3,550	3498	417.8	12%

Stove Tested By: Er.Nishant Gautam and
Shiva Hari Koirala
Designation: Research Officer
Dept. of Mechanical Engineering

Verified By: Dr. Bim Prasad Shrestha
Designation: Head of Department
Dept. of Mechanical Engineering

Annex 3D

VDCs of 6 project districts and the estimated number of stoves[41]

SN	District	Project Area		Village Development Committees (VDC)	Estimated no. of stoves
		Latitude	Longitude		
1	Parsa	26°55'0"N-27°25'00"N	84°22'0"E-85°13'00"E	Bagbanna	191
				Belwa	191
				Chorni	191
				Deukhana	191
				Gadi	191
				Harpur	191
				Jagaranathpur Sira	191
				Jeetpur	191
				Madhuban Mathaul	191
				Mahadevpatti	191
				Nichuta	191
				Nirmalbasti	191
				Paterwa Sugauli	191
				Sakhuwa Parsauni	191
				Sankarsariya	191
				Sedhwa	191
				Sonbarsa	191
				Subarnapur	191
				Supauli	191
				Thori	191
2	Bara	26°52'00"N-27°22'00"N	84°52'00"E-85°16'00"E	Amlekhganj	191
				Avab	191
				Banauri	191
				Bharatganj Sinaul	191
				Jhitakaiya Uttar	191
				Jitpur Bhawanipur	191
				Kakadi	191
				Kolhabi	191
				Lipanimal	191
				Nijgadh	191
				Parsauni	191
				Phattepur	191
				Pipra Simara	191
				Prasona	191
				Raghunathpur	191
				Rampurwa	191

[41] Given below is forecast of average stove installations in each VDC. However, the actual number of stoves installed in each VDC may vary in real situation.

				Ratanpuri	191
				Sapahi	191
				Tetariya	191
				Umarjan	191
3	Rautahat	26°40'00"N-27°14'00"N	85°10'00"E-85°31'00"E	Badharwa	191
				Basbiti Jingadiya	191
				Bishrampur	191
				Chandranigahapur	191
				Dumariya(Matiauna)	191
				Fatuwa Harsaha	191
				Ghamariya Birta	191
				Hadirya Paltuwa	191
				Judibela	191
				Kanakpur	191
				Laksminiya	191
				Laxmipur	191
				Paurai	191
				Pratappur Paltuwa	191
				Raghunathpur	191
				Ramoli Bairiya	191
				Rangapur	191
				Sakhuwa Dhamaura	191
				Santapur (matiyon)	191
				Simara Bhawanipur	191
4	Sarlahi	26°42'00"N-27°08'00"N	85°20'00"E-85°49'00"E	Atrouli	191
				Bhaktipur	191
				Dhungrikhola	191
				Ghurkauli	191
				Gourisankhar	191
				Hariyon	191
				Ishworpur	191
				Jabdi	191
				Janaki nagar	191
				Kalinjor	191
				Karmaiya	191
				Lalbandi	191
				Murtiya	191
				Narayankhola	191
				Netragunj	191
				Parwanipur	191
				Pattharkot	191
				Ranigunj	191
				Sasapur	191
				Shankarpur	191
5	Mahottari	26°40'00"N-27°08'00"N	85°41'00"E-85°59'00"E	Aurahi	191
				Bardibas	191

				Belgachhi	191
				Bharatpur	191
				Bijalpura	191
				Fulakaha	191
				Gauribas	191
				Gaushala	191
				Hathilet	191
				Khayarmara	191
				Kisan Nagar	191
				Laxminiya	191
				Maisthan	191
				Meghanathgorahanna	191
				Nigaul	191
				Pashupatinagar	191
				Ramnagar	191
				Shreepur	191
				Sonamai	191
				Vagaha	191
6	Dhanusha	26°38'00"N-26°57'00"N	85°51'00"E-86°14'00"E	Baramajhiya	191
				Bateshwar	191
				Begadawar	191
				Bharatpur	191
				D.Govindapur	191
				Dhalkebar	191
				Dhanushadham	191
				Digambarpur	191
				Godar	191
				Hariharpur	191
				Labatoli	191
				Nakatajhijh	191
				Puspalpur	191
				Ramaidaiya Bhawadi	191
				Sakhuwa Mahendranagar	191
				Shantipur	191
				Tulsichauda	191
				Umaprempur	191
				unnamed vdc in bet hariharpur and dhalkebar	191
				Yagyabhumi	191

Annex 3E

3.4.2 Projection of timber consumption

The timber consumption projections given in Appendix Table 3.7 were generated by multiplying the per capita figures of Table 3.8 by the projected population. A summary is given in Table 3.9 and in graphs in Figures 3.7 and 3.8.

Table 3.9 Projected timber consumption ('000 m^3)

Zone/Region	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
High Himal	2	2	3	3	3	3
High Mntns	85	103	122	136	135	129
Middle Mntns	519	678	879	1082	1218	1345
Siwaliks	92	126	171	220	259	300
Terai	435	601	830	1066	1267	1474
FWDR	97	127	173	202	227	250
MWDR	145	191	250	312	356	401
WDR	235	312	411	514	591	668
CDR	369	488	640	795	902	1002
EDR	287	392	531	684	806	930
Nepal	1133	1510	2005	2507	2882	3251

Table 3.1 Medium-variant population projections ('000)

Zone/Region	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
High Himal	30	30	30	30	28	25
High Mntns	1275	1307	1306	1269	1188	1068
Middle Mntns	7740	8579	9369	10087	10691	11150
Siwaliks	1374	1594	1822	2052	2276	2484
Terai	6490	7598	8758	9948	11119	12224
FWDR	1456	1607	1750	1880	1990	2074
MWDR	2171	2422	2670	2909	3129	3322
WDR	3502	3940	4374	4797	5188	5533
CDR	5503	6179	6826	7419	7922	8310
EDR	4277	4960	5665	6381	7073	7712
Nepal	16909	19108	21285	23386	25302	26951

Appendix Table 3.6 Industrial fuelwood consumption projections for Nepal ('000 mt)

Zone	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
Nepal						
Middle Mountains	79.2	91.4	107.1	119.6	110.3	101.6
Siwaliks	14.1	17.0	20.8	24.3	23.5	22.6
Terai	66.4	80.9	100.1	118.0	114.7	111.4
Total	159.7	189.3	228.1	261.9	248.5	235.7
Far Western Development Region						
Middle Mountains	8.0	9.1	10.5	11.6	10.6	9.7
Siwaliks	0.5	0.6	0.7	0.8	0.8	0.8
Terai	4.5	5.4	6.6	7.7	7.4	7.2
Total	13.0	15.1	17.9	20.2	18.9	17.6
Mid-Western Development Region						
Middle Mountains	9.8	11.3	13.4	15.0	14.0	13.1
Siwaliks	3.8	4.6	5.7	6.7	6.5	6.4
Terai	4.3	5.2	6.5	7.7	7.6	7.5
Total	17.9	21.2	25.5	29.5	28.1	27.0
Western Development Region						
Middle Mountains	22.5	26.1	30.8	34.6	32.2	30.0
Siwaliks	1.9	2.3	2.9	3.4	3.3	3.2
Terai	8.8	10.8	13.4	15.9	15.6	15.3
Total	33.3	39.3	47.1	53.9	51.1	48.5
Central Development Region						
Middle Mountains	24.1	27.5	31.8	34.9	31.5	28.4
Siwaliks	5.7	6.9	8.3	9.6	9.0	8.5
Terai	24.5	29.4	35.8	41.4	39.4	37.5
Total	54.4	63.8	75.9	85.8	80.0	74.4
Eastern Development Region						
Middle Mountains	14.8	17.3	20.7	23.5	22.0	20.5
Siwaliks	2.1	2.6	3.2	3.8	3.8	3.7
Terai	24.3	30.1	37.8	45.2	44.6	44.0
Total	41.1	50.0	61.7	72.5	70.4	68.2

Source: Total figures were based on data from UNDP/WB, Nepal: Issues and Options in the Energy Sector, August 1983. Then total figures were prorated among the subregions acccording to population.

Annex 3F
SAMPLING PLAN

Parameter	Objective	Timeframe/Frequency	Method of Data Collection	Use of Data	Target Population	Sampling Frame	Known Characteristics
ηnew	Determining mean efficiency of the stoves in use.	Measurement taken every year for stoves used for one year and two years.	Technical testing following stove testing protocol developed by University of California, Berkeley and The Shell Foundation	The mean value will be used to estimate emission reduction using the formula suggested by AMS-II.G methodology	Stove user households	List of households having stoves installed/purchased at the time of monitoring	Efficiency measured in terms of % heat utilization, usually lies between 28.72-33.46% for efficient fuelwood stoves
Stove Emissions (CO and $PM_{2.5}$)	Determining mean emission level during winter and summer season	Measurement taken every six months	Measurement taken using HOBO and UCB Particle Monitor following standard guidelines of the manufacturer	The mean data will be used to quality of indoor air. To have idea on stove performance.	Stove user households	List of households having stoves installed/purchased at the time of monitoring	Carbon monoxide (CO) and $PM_{2.5}$ are measured in terms of ppm and $\mu g/m^3$.
% of stoves in use	Determining percent of stoves in operation	Measurement taken every year	Structured questionnaire survey conducted among the user households	The percentage values will be used to estimate total stove-year, which is needed to compute total B_y.	Stove user households	List of households having stoves installed/purchased at the time of monitoring	There may be some user households who have abandoned using the stove for some reason. This needs to be deducted in total emission calculation.

No. of months stoves are in use	Determining stove-year of stoves in operation	Measurement taken every year	Structured questionnaire survey conducted among the user households	The average stove-year needed to compute total B_y.	Stove user households	List of households having stoves installed/purchased at the time of monitoring	If a stove is used for one whole year, its completed useful life is said to be one stove-year. Some users may be expected to use the stove less than 12 months. Therefore, completed useful life needs to be estimated for each stove.
Fuelwood consumption by non user households	Determining leakage by non user households	Measurement taken every year	Structured questionnaire survey conducted among the non user households	The average values will be used to see if there is statistically significant difference between current and baseline consumptions. If yes, it will be used in leakage calculation.	Non use households inside and outside the project area	List of households of similar characteristics but not having stoves	The baseline consumption of fuelwood by households before the project activities were initiated is known from the baseline survey.

Parameter	Sampling Method	Desired Precision	sample size	Formula calculating confidence and precision	Administering Data Collection	Quality Assurance	Data Analysis
ηnew	Systematic Sampling will be followed. Stove user households will be arranged by corresponding LPOs then by year of installation then by promoter. Note that LPOs work in distinct geographical areas (VDCs) through different stove-Promoters.	Confidence level = 90% Precision = 10%	**68** Based upon formula used and values assumed.	Since variance of the parameter is not known a priori, the preferred formula is that used for estimating sample size for proportions given below: $n = \frac{Z^2pq}{e^2}$ 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 formula $n = \frac{Z^2S^2}{d^2}$ might be used from the second survey onwards as variance (S^2) from the first survey will be at hand.	Independent third party	Project Manager, District Technical Officer, Carbon Finance Unit	Independent third party (external consultant)

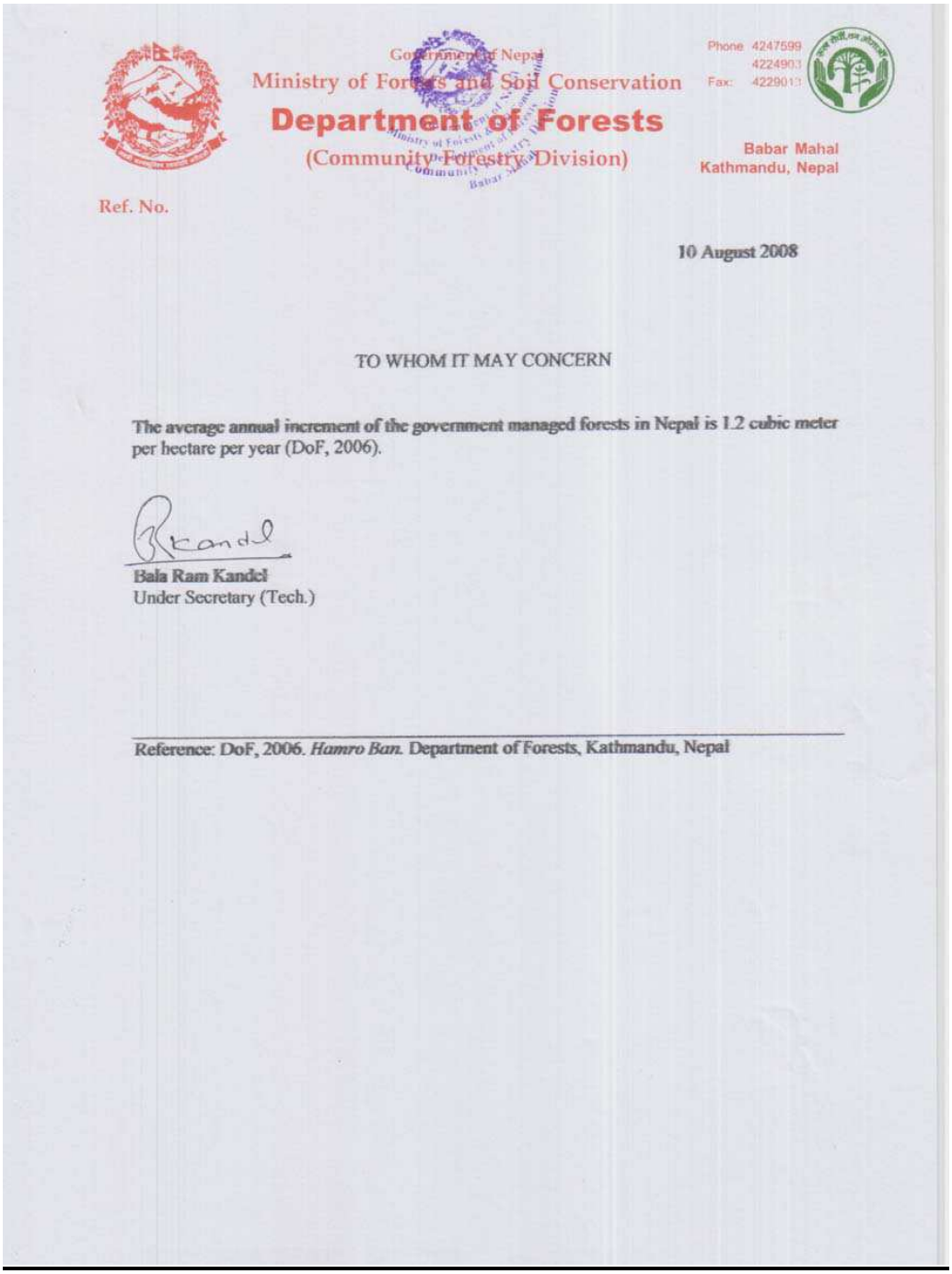
Stove Emissions (CO and $PM_{2.5}$)	Systematic Sampling will be followed. Stove user households will be arranged by corresponding LPOs then by year of installation then by promoter.	Confidence level = 90% Precision = 10%	**68** Based upon formula used and values assumed.	Since variance of the parameter is not known a priori, the preferred formula is that used for estimating sample size for proportions given below: $n = \frac{Z^2pq}{e^2}$ where, n ~ sample size Z ~ is the corresponding abscissa of the normal curve for 90% confidence level p and q ~ estimated proportion of attribute, conservative value of 0.5, 0.5 has been taken. e ~ desired level of precision, 10%	Independent third party	Project Manager, District Technical Officer, Carbon Finance Unit	Independent third party (external consultant)

% of stoves in use	Systematic Sampling will be followed. Stove user households will be arranged under their corresponding LPOs then year of installation then promoter.	Confidence level = 90% Precision = 10%	**68** Based upon formula used and values assumed.	Since variance of the parameter is not known a priori. , the preferred formula is that used for estimating sample size for proportions given below: $n = \frac{Z^2pq}{e^2}$ 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%	Independent third party. Local enumerators supervised by external consultant.	Project Manager, District Technical Officer, Carbon Finance Unit	Independent third party(external consultant)

No. of months stoves are in use	Systematic Sampling will be followed. Stove user households will be arranged under their corresponding LPOs then year of installation then promoter.	Confidence level = 90% Precision = 10%	**68** Based upon formula used and values assumed.	Since variance of the parameter is not known a priori. , the preferred formula is that used for estimating sample size for proportions given below: $n = \frac{Z^2pq}{e^2}$ 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%	Independent third party. Local enumerators supervised by external consultant.	Project Manager, District Technical Officer, Carbon Finance Unit	Independent third party(external consultant)
Fuelwood consumption by non user households	Random sampling will be followed.	Confidence level = 90% Precision = 30%	**8** Based upon formula used and values assumed.	To be consistent, the same formula as above has been used taking the desired level of precision as 30%, all other values being the same. This is to satisfy 90/30 precision as per para 8 of the methodology, AMS- IIG.	Independent third party Local enumerators supervised by external consultant.	Project Manager, District Technical Officer, Carbon Finance Unit	Independent third party (external consultant)

The above formula was developed by Cochran for large populations. In the first six month time, the total installation is expected to cross 4000 which will eventually increase to 22920 in two year's time. 4000 is considered a large population in statistics. Cochran, W.G. (1977), John Wiley & Sons, Inc. New York.

Annex 3G



Government of Nepal
Ministry of Forests and Soil Conservation
Department of Forests
(Community Forestry Division)

Phone 4247599
4224903
Fax: 4229013

Babar Mahal
Kathmandu, Nepal

Ref. No.

10 August 2008

TO WHOM IT MAY CONCERN

The average annual increment of the government managed forests in Nepal is 1.2 cubic meter per hectare per year (DoF, 2006).

Bala Ram Kandel
Under Secretary (Tech.)

Reference: DoF, 2006. *Hamro Ban.* Department of Forests, Kathmandu, Nepal

Annex 3H

A Focus on Adaptation to Climate Change in Context of Nepal

Lachana Shresthacharya, Programme Officer, CRT/N

Climate change is a global phenomenon posing risks which are observed in all parts of the world. Nepal is identified as one of the vulnerable countries to the impacts of climate change. There are evidences showing changes in climate and affecting the people in Nepal. Consultation with local resident reveals erratic rainfall pattern, rise in temperature, reoccurring floods and drought conditions. Besides, other commonly observed changes such as change in seasonal weather pattern, invasion of undesirable plant and pest species have major impacts at local level. The records of the Department of Hydrology and Meteorology confirm that temperature of country has increased in average by 1.6 Celsius in last thirty two years from 1975 to 2006. Due to these changes, livelihood based on agriculture is having difficulty for higher productivity. In addition to agriculture sector, adverse effects can be seen in sectors like water resources, forests and health as well.

Communities in different regions of Nepal are vulnerable to climate change-induced hazards such as flash floods, landslides and drought. Such hazards have been more frequent and of higher magnitude in recent years and all adversely affect community livelihoods. These affect hydropower generation, irrigation and rural livelihoods. With these identified risks and uncertainties by climate change, it requires capacities, resources in the community to address them. There is a need for factors such as financial resources, information, know-how, knowledge and technology in order to address those risks and uncertainties.

In a country like Nepal where about 30 percent of population survives below poverty line, adaptation involves doing well despite changing conditions. While adaptation as defined in Intergovernmental Panel for Climate Change (IPCC) is an adjustment in ecological, social or economic systems in response to observed or expected changes in climate and their effects and impacts to lessen adverse impacts of change or take advantage of new opportunities. The dimensions of adaptation can be implemented in preparation for or in response to impacts generated by changing climate. Implementation of adaptation options can involve building adaptive capacity or transforming capacity to action. Building capacity may involve increasing ability of individuals, groups (communities) or organizations to adapt to changes.

In addition, common adaptation practices involve modifying existing resource management strategies like livelihood enhancement initiatives, disaster preparedness plan or sustainable development program. It is more important to develop systems on which their livelihood options are resilient and flexible so that vulnerable people are able to respond to the change. However, local people try to cope with those changes, probably not being aware of climate change issues and consequences. For instance, farmers plant new varieties of crops, embankments are built to prevent flooding, people use water disinfectants to avoid water borne diseases. Common adaptation approaches seen in the community made by local people are such as participatory plant breeding to develop drought-resistant rice and other seeds, increasing access to local plant genetic resources (e.g. seed banks) for the poor, adaptation technologies for reducing vulnerability (e.g. hedgerow plantation organic farming, rain water harvesting, energy technologies).

In recent years, in Nepal, it shows voluntary practices to adaptation to climate change at community level with social network, with NGOs and INGOs, international support networks. Besides these approaches in the community level, there have been some initiatives in the national level. Climate Policy and National Adaptation Programmes of Action (NAPA) are drafted by the government level. The climate policy contains section on risks, adaptation policy, strategy and action plan which explains briefly on participation of local members for awareness raising and implementation. The preparation of NAPA is the first official initiative for mainstreaming adaptation to national policies and actions for addressing issues of climate change. Submission of this document to United Nations Framework Convention on Climate Change (UNFCCC) would facilitate access to resource from the Least Developed Country Fund for defined climate change adaptation projects. Similarly, Carbon and Climate Unit has been established recently as a unit in Alternative Energy Promotion Centre so that it could work at central level policy, planning, regulation and implementation.

With all these facts, it can be concluded that there is a few climate change initiatives, more specifically adaptation initiations carried out in the country with institutional and non/governmental agency support. Most of these practices observed are with the support from I/NGO level or at the voluntary level from the community level, where as with least participation from the national level. Therefore, communication in between government and those implementing organizations and also in between local and central government has to be strengthened. There seems to be a need to put forward initiatives like institutional development, technology transfer, capacity building, awareness-raising to build adaptive capacity.

Promotion and Dissemination of ICS Technology in LFP Terai Area

A short project "Promotion and Dissemination of ICS Technology in LFP-Terai Programme Districts Kapilvastu, Nawalparasi and Rupandehi Districts" has been implemented from December 2009 to June 2010 with the financial support from Livelihoods and Forestry Programme (LFP) Katmandu and technical input from CRT/N. The project has been extended up to December 2010.

Testing of repaired ICS

There were 223 ICS installed up to end of June at 15 VDCs of the three districts. Similarly, total 44 local people have been trained as ICS promoters. Training of Trainers was given to 12 staffs from 6 LPOs. Monitoring and follow up of installed ICS and support to local promoters is carried out by CRT/N staffs, LPOs and promoters.

CRT/N newsletter

CENTRE FOR RURAL TECHNOLOGY, NEPAL

July 2010, Vol. 10 No. 2

Renewable Energy Training Conducted in Afghanistan

A training/demonstration of renewable energy and appropriate technologies has been successfully completed in Kabul, Afghanistan in coordination and support from the Learning for Community Empowerment Programme Phase 2 (LCEP-2) of United Nations Human Settlement Programme (UN-HABITAT), Afghanistan from 9 January to 5 February 2010. The main objective of this assignment was to transfer skills and knowledge on renewable energy technologies to selected Provincial Trainers working in LCEP-2, UN-HABITAT through short training/demonstration courses. The training team was led by Mr. Hari Gopal Gorkhali, Director, Mr. Gyanendra Sharma, Senior Officer and Mr. Ghanshyam Poudel, Programme Assistant from Centre for Rural Technology, Nepal (CRT/N) for the assignment. During the training, the major emphasis has been given on practical aspects of the technologies and its application by the targeted rural families/community. In addition, monitoring and follow-up actions have been suggested as per scheduled plan to ensure proper transfer of knowledge about the technology and to maximize its benefit to the end users.

Mr. Gorkhali also attended a meeting/ discussion with the representatives of UN-HABITAT from 2-9 January 2010 as per the assignment provided by UN-HABITAT, Afghanistan.

Participants practicing 2-pot hole ICS in Afghanistan

CRT/N Nominated for World Energy Globe Award

CRT/N was selected as one of the nominees for Austria based World Energy Globe Award 2010. Altogether 15 projects were short listed in five categories out of 886 projects from 105 countries.

CRT/N was nominated in the fire category for its Improved Water Mill (IWM) Programme, supported by Government of Nepal and The Netherlands Development Organisation (SNV/ Nepal). The award giving ceremony was held in Kigali, Rwanda on 3 June 2010. Mr. Lumin Kumar Shrestha, Director, received the certificate of nomination at the ceremony.

Certificate for Nominee World Energy Globe Award

CDM Project under Validation

A team from Det Norske Veritas (DNV) visited Nepal for the validation of the CDM (Clean Development Mechanism) Project developed by CRT/N and Egluro, a UK based company. Mr. Astakala Vidyacharan- CDM Validator and Ms. Sharmistha Shome-GHG Auditor, DNV visited CRT/N office in Kathmandu as well as the project site during 6-12 March 2010. The CDM project entitled Efficient Fuel Wood Cooking Stoves Project in Foothills and Plains of Central Region of Nepal will be implemented in six Terai districts, namely, Parsa, Bara, Rautahat, Sarlahi, Mahottari and Dhanusha and some 26000 improved cooking stoves (ICS) will be disseminated.

During the period of validation, documents related to the project were accessed and verified by the validators. Furthermore, a field visit was made to the project site. During the visit, stoves installed at Parsauni Village Development Committee, Bara district were observed. Interactions were carried out with the local stakeholders-local NGO, district energy and environment unit, forest user group, local beneficiaries-stove users and government officials. Besides the field level activities, the validators had an interaction with the Government of Nepal's focal person at Designated National Authority (DNA) - Mr. Purushottam Ghimire, Joint Secretary, Ministry of Environment.

After the visit, a draft validation report was submitted by the validators to CRT/N with some clarifications request which has been effectively responded and justified. At this stage, CRT/N is expecting for final validation report after which the project would progress towards registration process. The DNA has approved the CDM project.

CDM Validators in Bara District observing installed ICS

Annex 4

MONITORING INFORMATION

ID	Data	Data Unit	Data Source	Frequency	Value	Measurement methods	QA/QC procedure	Comment
1	Project Villages/ Village Development Committees (Vn)	Number	District Map	Monthly	No of village/VDC where stoves have been disseminated	Highlighted in District Map	-	Data is updated every month and forwarded to CRT/N central office in Kathmandu.
2	Type of stove displaced/dismantled (Dn)	Number and Type	Monthly installation/Sales Data base	Monthly	Max 22920	Information of dismantled stoves at user household will be recorded by promoter in their database during installation/sale of stoves. 68 households will be sampled during the survey by third party consultant.	Data will be randomly checked by independent third party consultant during annual sample survey.	-
3	Total number of efficient stoves disseminated (Ny)	Number	Monthly installation/Sales Data base	Monthly	No of stoves disseminated in each VDC	50% Spot checks by promoters, project staffs including project manager, with 5% cross check from central level.	Programme Manager to cross check 10% stove randomly and CRT/N central office to check 5% of the stove installed/sold annually.	Data is updated every month and forwarded to CRT/N central office in Kathmandu.
4	Percentage of stoves in use (Uy)	%	Structured questionnaire sample survey conducted among the user households	Annual	Usually more than 95%	Statistically significant sample (see B.7 and Annex 3F for sampling plan)	Independent third party to undertake the survey.	Survey report by independent third party in paper and electronic version
5	No. of months stoves are in use (ty)	No.	Structured questionnaire sample survey conducted among the user households	Annual	Usually more than 11 months	Statistically significant sample (see B.7 and Annex 3F for sampling plan)	Independent third party to undertake the survey.	Survey report by independent third party in paper and electronic version
6	Efficiency of Appliance replaced η_{new}	% heat utilized	Water Boiling Test for each year of operational stove	Annual	28.72%	Water boiling test for fuel efficient stoves will be carried out in each district as part of monitoring.	Independent third party survey	Data archived both in paper and electronic form

7	Stove Emissions (CO and PM2.5)	ppm and µg/m3	Field measurement of the emissions for existing traditional stoves and Fuel efficient stoves by project team	Every 6 months	Less than that of the traditional stoves used in the project areas	The measurement will be taken by using standard instruments like the UCB PM Monitor and Hobo CO monitor or the equivalent instrument available.	Project Team supported by technical team at CRT/N will carry out the emission testing	Data archived both in paper and electronic form
8	Quantity of woody biomass used by non user households (in tonnes) Ly	Tonnes/year	Sample Survey	Annual		Sample survey will be conducted by independent third party on periodic basis to determine the quantity of woody biomass used by non user households. The value will be compared with the baseline data of 2.7 tonnes per year per household. If the values are statistically different, adjustment will be made in leakage calculation.	Qualified third party will be hired to conduct the survey independently.	-