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

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	11/01/2011	• Internal Draft Version
02	12/08/2011	• Revise as the new methodology AMS.II.G Version 03
03	10/10/2011	• Project user adjustment
04	09/04/2012	• Reply to clarifications and /or corrective action of GS
05	21/05/2012	• 1st reply to internal validation
06	02/07/2012	• 2nd reply to internal validation
07	27/11/2012	• Data update

SECTION A. General description of small-scale project activity

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

>>
WWF Mamize Firewood-Saving Cook Stove Project III
Version: 07
Completion date: 27/11/2012

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

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A.2.1. The purpose of the project

The proposed WWF Mamize Firewood-Saving Cook Stove Project III will replace 400 conventional cook stoves—stoves which are used by the inhabitants living in the Mamize Nature Reserve (henceforth MNR) in Sichuan province, P.R. China—with firewood-saving cook stoves (FCS). At present, the people who live in the reserve cut down a huge amount of trees each year for cooking and heating purposes, causing the reserve's forest to retreat rapidly. Average individual income in the MNR area (2,866 CNY/yr[1]) is much lower than in nearby Liangshan city[2] (15,506 CNY/yr). The income of the locals is derived mainly from agriculture, livestock farming, fruit plantations and the collection of herbs and mushrooms.

Due to the MNR area's underdeveloped transportation infrastructure, patchy electricity supply and high electricity prices, there is no affordable alternative to replace wood as a source of heat and power. Without outside financial support, such as a carbon subsidy or third party donation, the local people will not be able to afford to upgrade their stoves. To solve this challenge, ***WWF Schweiz*** has agreed to pay all of the necessary FCS investment (in a upfront pattern) in return for future GS VERs derived from the project. South Pole Carbon Asset Management Ltd. will act as the Project Owner to whom the stove users would transfer the carbon credits generated from the proposed project.

WWF have started the research of the proposed project since 2009. The GS Local stakeholder Consultation meeting was held on 16/10/2011 in Gudui town and 14/02/2012 in Qingkou town[3]. The construction started on 18/10/2011 and expects to be finished by the middle of 2013.

The MNR is located in the province of Sichuan, in a mountainous (subtropical) area in China. The reserve is famous for its abundant biodiversity and has a reputation as a gene bank of animal and plant species. MNR also marks the southern edge of the Giant Panda's habitat. The area of the reserve is 38,800 hectares, and its altitude varies between 1,130m and 3,961m.

1 2009 Leibo Statistic Bulletin

[2] http://wenku.baidu.com/view/3a81f739580216fc700afd01.html

[3] LSC report

A.2.2. How the project reduces greenhouse gas

FCS (see picture 1) reduces greatly the non-renewable biomass combustion and associated CO_2 emissions. At present, families living within the project boundary use firewood as the main fuel for cooking and heating. The Three Stone Fires or TSF (see picture 2) and rough Mud Stove or MS (see picture 3) are the main cooking instruments; no other cooking instruments are used. Due to low thermal efficiency, these old stoves use a considerable amount of firewood per year, causing local people to spend a lot of time gathering firewood. As populations increase, so too does the demand for firewood. This leads to more deforestation and an increase in the rate at which the MNR is retreating. In addition to deforestation, cooking with the old stoves causes health threatening smoke pollution, especially for women and children who typically spend more time in the kitchen area than men.

A.2.3. Technology description

FCS has been used for several decades in China. The technology is "mature." Compared with TSF and MS, FCS has an additional air flowing system, which includes a chimney and grate (see pictures 4 and 5). The chimney and grate allow the firewood to be combusted completely (typically in the kitchen area) and the smoke to escape the room. A fire-block-circle (see picture 6) reduces the amount of thermal energy loss by keeping the hot smoke for a longer period of time under pots that run directly into the chimney. This allows the pots to absorb the thermal energy carried by the smoke. Experience shows that FCS saves on wood consumption (thus less deforestation) and reduce cooking time.

The height of the stove is 75-80cm and chimney is 3-4m, the general size of burning room is 27*20*15cm. The chimney could be built inside or outside of the wall depending on the kitchen space. More stove detail please see *Mamize FCS Construction Standard*.

Typically, FCS contains two pots with the diameter of 80cm, one for cooking food and another for forage for animals. Many families cook food and forage in the same pot. In general, separating food from forage in two pots makes the food cleaner and healthier. The FCS body is covered by tiles, which make the stove clean and bright compared to a mud stove.

Picture 1. FCS

Picture 2. Three Stone Fire (TSF)

Picture 3. Mud Stove (MS)

Picture 4. Structure of FCS

Picture 5. Grate of FCS

Picture 6. Detail of Fire-Block-Circle

The project will construct 400 FCS for local families for free within the span of two years. The project is expected to reduce GHG emissions by 3,791 tCO_2e annually.

A.2.4. Contribute to sustainable development

The project will contribute to the sustainable development in the region. The project will:

- Reduce the rate of deforestation and ease the human impact on the MNR,
- Reduce air pollution associated with cooking with the old stoves and protect human health in the process,
- Enhance species diversity (both flora and fauna) by preserving the natural forest, and
- Release women and children from the hard labour associated with wood procurement/cutting.

A.3. Project participants:

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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)

Switzerland	WWF Schweiz (NGO)	No
China	Sichuan Kangmei Community Development and Market Company Ltd. (Private entity)	No
Switzerland	South Pole Carbon Asset Management Ltd. (Private entity)	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:

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A.4.1.1. Host Party(ies):

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P.R.China

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

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Sichuan province

A.4.1.3. City/Town/Community etc:

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Leibo county of Liangshan City (see picture 7, 8 and 9)

Picture 7. Location of Leibo County

Picture 8. Map of Liangshan

Picture 9. Map of the inhibitions within the project

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

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The project targets 400 households in the towns of Chenghe, Lami, Shanlinggang and Qingkou

all within the MNR. The MNR is under the jurisdiction of Leibo County.

Town	Stove quantity	Coordinate
Gudui	0	N: 28˚21`32``~28˚26`29``, E: 103˚19`22``~103˚20`14``
Changhe	38	N: 28˚18`13``~28˚20`13``, E: 103˚19`41``~103˚22`28``
Lami	62	N: 28˚14`53``~28˚16`36``, E: 103˚21`8``~103˚22`7``
Shanlinggang	100	N: 28˚15`56``~28˚19`47``, E: 103˚23`17``~103˚25`4``
Qinglou	200	N: 28˚20`19``~28˚16`32``, E: 103˚40`49``~103˚42`0``

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

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The project is a micro-scale improved distributed cooking stove project, which belongs to the category of **End-use Energy Efficiency Improvement** project activity as specified in the GS Requirements.

TSF and MS, with a thermal efficiency as low as 10%, burn a large amount wood during daily cooking. The new FCS is predicated to raise the efficiency to no less than 20%[4]. The total GHG emission reduction of this project is estimated at 3,791 tCO_2e/anually, which is below the 5,000 tCO_2e/a micro scale cap.

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

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A crediting period of fixed 10 (ten) years is selected for the project activity. An estimation of emissions reductions expected over the crediting period is provided in the table below.

Years	Estimation of annual emission reductions in tonnes of CO_2e
01/11/2011-31/10/2012	2791
01/11/2012-31/10/2013	3791
01/11/2013-31/10/2014	3791
01/11/2014-31/10/2015	3791
01/11/2015-31/10/2016	3791
01/11/2016-31/10/2017	3791

[4] Junjie Huang, Rongzhou Zhang, "A Manual for Construction and Operation of Biogas Plant and Fuel-Saving Stove"[M]. Beijing. 22.

01/11/2017-31/10/2018	3791
01/11/2018-31/10/2019	3791
01/11/2019-31/10/2020	3791
01/11/2020-31/10/2021	3791
Total estimated reductions (tonnes of CO_2e)	36910
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	3,691

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

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No ODA support is involved in the project (See Annex 2).

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:

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CDM methodology "Energy efficiency measures in thermal applications of non-renewable biomass --- Version 3.0" (AMS.II.G Version 3.0)[5]

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

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The methodology AMS.II.G Version 3.0 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[6] biomass fired cook stoves**[7] or ovens or dryers and/or improvement of energy efficiency of existing biomass fired cook stoves or ovens or dryers.

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

The proposed project is a high efficiency biomass fired cook stove project with the specified efficiency around 20%. The new stoves will reduce the GHG emission by reducing the burn of non-renewable biomass applied to national standard. The project also meets the requirement as dedicated in the methodology that non-renewable biomass has been used since 31 December

[5] http://cdm.unfccc.int/methodologies/DB/6U8JYO9XTLVZ8LJ7GUBSZP145BIDG2

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

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

1989 because the local people have been using the wood biomass as fuel for about 280 years (see Annex 3 to the present document). Since then, the forest has retreated gradually as the rise of the population.

The project involves the transfer of 400 FCS to 400 households. The project will reduce GHG emissions by 4,322 tCO2e annually, which falls within the scope of micro scale project of Gold Standard.

B.3. Description of the project boundary:

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The boundary comprises a) the 400 households located in the towns of Gudui, Changhe and Lami and b) the firewood collection forest area (see picture 7).

As the plan of the project, new FCS from other project could also be set up in the above three towns. In order to figure out the households from the different projects, the databases would be prepared for each project before the stove contraction in which way the stove owners could be divided clearly.

B.4. Description of baseline and its development:

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In order to give a clear and accurate description of the wood consumption in the baseline, wood consumption is divided into five categories (see below).

B.4.1. Living habit description

TSF is the most important cooking and heating instrument for every home in the project site. However, 83.2% of the families also own a Mud Stove (MS). The MS is mainly used for cooking meals and forage for pigs and other livestock, such as sheep and cattle. The MS has no chimney, grate or air supply system; the smoke always flows back into the house during cooking. The MS is not energy efficient but can accommodate bigger pots and meet the cooking habit.

Five Categories of firewood usage in baseline scenario

I. Cooking food in the cold season

In the cold season, which can last as long as 6 to 10 months each year, people usually cook daily meals on TSF as they burn wood in TSF for heating during this season all day long. Since the FCS cannot replace the TSF as a heating instrument, we assume that people will continue to cook food on the TSF taking used of the heating fire during the cold season even if they have a FCS. So, the project scenario for this component does not result in a reduction in firewood use.

II. Cooking food in the warm season

During the warm season, when the TSF usually does not work, meal cooking is transferred to MS in the baseline scenario. So FCS could replace MS in the project scenario during the warm season, which could reduce wood consumption (A1).

III. Cooking forage for pigs

Due to poor road infrastructure and lack of market, all of the families raise pigs for food by themselves. There are 4.35 pigs per family on average according to Baseline Survey Report. People boil tomatoes, corn and grass to feed pigs throughout the year as the traditional method (see picture 8). The chemical forage, which doesn't need cooking, hasn't accepted by local people yet. This part of forage is cooked mainly on MS and TSF and can be used when there is no MS. A new FCS will replace MS or TSF for cooking pig forage and reduce this use of firewood (A2). Relatedly, the FCS is able to contain/boil more forage and makes firewood feeding easy.

Picture 10. Pig Forage Cooking

IV. Cooking forage for other livestock

Many of the inhabitants keep a large amount of sheep, goats, cattle and horses. In winter, when animals cannot be herded outside, they are fed at home by boiling grass, forage and water in a big pot on the MS or TSF. This feeding phase usually lasts for three months. The FCS will reduce this part of firewood consumption (A3).

V. Heating

Local people sit around the TSF for long periods of time during the cold season, which can last six to 10 months each year. Since the FCS cannot replace the TSF for heating purposes, it will not save any wood for this part.

In sum, FCS can reduce firewood consumption in three categories among all five cases. The amount of reduced firewood consumption is seen in Table 1.

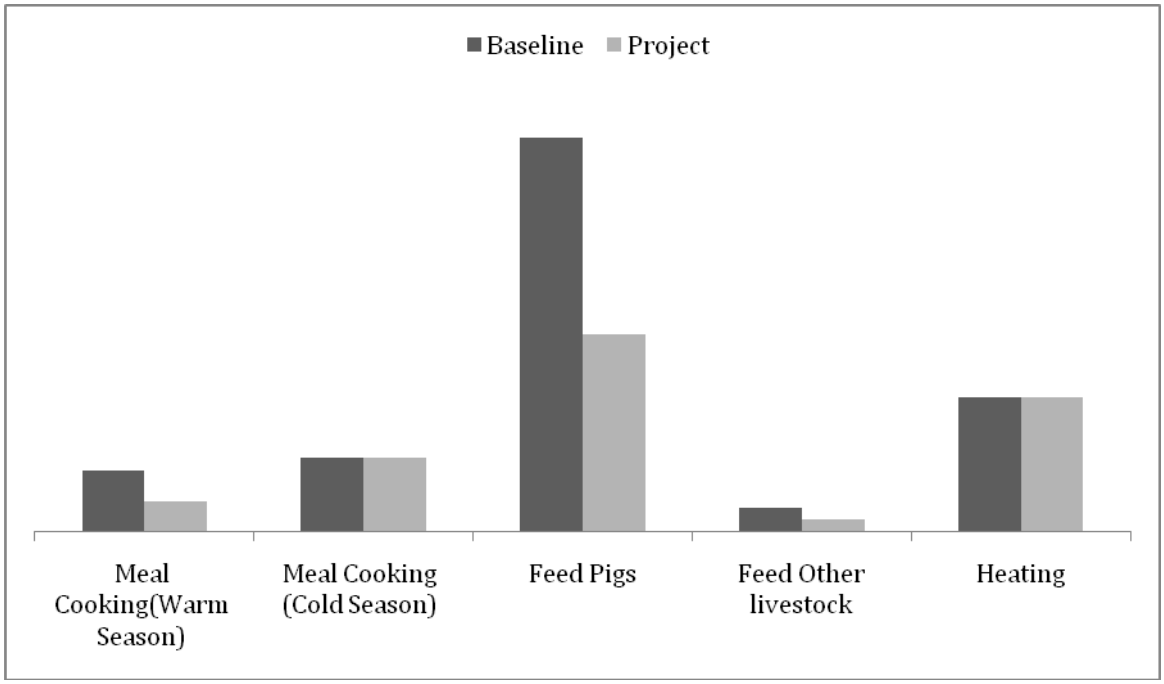
Table 1. Firewood Consumption by Category

Item		**Meal Cooking**		**Feed pigs**	**Feed other livestock**	**Heating**
Baseline Scenario	**Period**	Warm season	Cold season	12 months	2-3 months	6-10 months
	Wood	A1	B1	A2	A3	B2

	consumption					
	Stove type	MS， TSF	TSF	MS, TSF	MS， TSF	TSF
Project Scenario	**Stove type**	FCS	TSF	FCS	FCS	TSF
Wood Reduction		A1∗ (1-ηb/ηp)	0	A2∗ (1-ηb/ηp)	A3∗ (1-ηb/ηp)	0

η_b,efficiency of baseline stove(s)
η_p,efficiency of project stove(s)

Figure 1. Firewood Consumption Comparison between Baseline and Project Scenario



B.4.2 Survey method

A randomly sampled of 420 families wthin the over all 2,804 target households were selected and interviewed during the baseline survey in October of 2010.

The baseline survey interview contained questions on the amount of wood and time needed to: cook family meals in the summer and winter, heat homes, and cook forage for animals of the TFS and MS users. Because local people usually have no clear idea about the accurate weight of the firewood consumption, they were asked how many “bundles of wood” they burnt for various

tasks. Using this proxy estimate, the mass of wood bundles was weighted later on.

The interview also contained questions on wood collection distance, collection labor and firewood species collected.

The firewood moisture was tested by the wood-moisture testers by sample during baseline survey. The wood samples were selected randomly from local woodpiles. The average moisture content proved to be 23.3% was used to calculate the dry matter of the wind-dried firewood. As the sample quantity didn't reach the 95/5 precision, the upper edge of 95% confident interval of were adopted in the project.

Table 2. Moisture Content of the Firewood

NO.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
MC(%)	23	29	22	22	23	22	21	22	23	16	19	19	20
Even value			**σ**			**Margin of error**				**Upper of confident interval**			
21.615			3.014			1.638				23.3			

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 VER project activity:

B.5.1. Identify the alternative scenario

In rural China the reliable replacements for wood-based cooking stoves are the biogas digester stove, coal stove, electric pot and FCS. In the project site, electricity supply is limited and the power price is too high for cooking purposes. Given this, the alternative scenario to the project will involve 1) the continued use of traditional cooking instruments (such as TSF and MS), 2) the importation of coal and coal-stoves, 3) the replacement of traditional stoves with biogas digester stoves, and 4) a loss of carbon subsidy.

B.5.2. Identify barriers that would prevent the implementation of the proposed project activity:

According to the guideline *Attachment A to Appendix B of the simplified modalities and procedures for small- scale project activity*, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the

following barriers: (a) Investment barrier; (b) Technological barrier; (c) Barrier due to prevailing practice; (d) Other barriers.

B.5.3. Identify barriers that would prevent the implementation of the proposed project activity

Baseline scenario (ii) Import coal and coal-stove as alternative
Coal is the common cooking fuel in rural China. Compared with free firewood, the cost of coal is quite high for local people. The TSF and MS cannot burn coal due to lack of air supply units. So a new special coal-burning stove must be purchased for them. Baseline survey showed that each family need about 22 ton dry wood annually on average in total, if they use coal as a replacement, 12.8 ton[8] coal are needed to supply the same thermal energy. The average coal price is no less than 500 CNY, consider the average coal stove price of 800 CNY, the total expenses is 7,200CNY. Compared with the free firewood and consider the average income of 2,866 CNY, coal isn't attractive for local families. So this is an investment barrier.

Baseline scenario (iii) Replace the traditional stove with biogas digester stove
The biogas digester is a popular cooking energy device in rural China. But the investment for the digester is much higher than FCS and the biogas digester in other area (about CNY 4,000). In addition, the wood-saving effect is low because it cannot supply enough thermal energy for forage cooking, which needs much more wood than meal cooking. Local families have no ability or desire to build biogas digesters. So the biogas digester stove is not suitable for local people and is an investment barrier.

Baseline scenario (iv) The project goes without carbon subsidy
There are 20 existing high-efficient cook stoves in Gudui town, located within the project boundary. These stoves were introduced with the support of the The North of England Zoological Society (NEZS) during 2009 and 2010[9]. After a one-year trial period, the FCS was quickly accepted by the inhabitants. At present, even though people want the new cookstoves, the local people have not produced plans to build them. The reason is simple: the cost to build a stove (1,500 CNY/stove) is prohibitively expensive for most of the local people. The incomes of local inhabitants are quite low (about CNY 2,866/person•annual) . Financial support from the NEZS is limited. Thus, this is an investment barrier that will prevent the implementation of the FCS distribution in the area if financial support from other sources (e.g., carbon market) does not materialize.

Outcome of B5.3: The **Investment Barrier** is the main reason to prevent the implementation of the alternative scenarios ii), iii) and iv).

[8] $CV_{Anthracite}$=26.7 TJ/Gg, CV_{wood}=15.6 TJ/Gg as Table 1.2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy.

[9] Introduction of NEZS 20 FCS Project

B.5.4. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

As stated in the analysis in B.5.4, only alternative i) *,continue use their traditional cook instruments*, is not prevented by any identified barrier.

In the alternative scenario (i), the inhabitants will continue to cut and burn the wood for free. No cookstove investment will be needed. The continuation of the status quo (traditional cooking methods and fuel gathering) is the most stable scenario that can happen in the baseline scenario. This scenario will not be prevented by any investment or barrier.

B.5.5. Common practice

a) Analyze other activities similar to the proposed project activity:

Since 2009, in Gudui town (which lies within the boundary of the proposed project), only 20 similar FCS projects have been supported by the North of England Zoological Society (NEZS) . The living conditions and habits of the NEZS cookstove users in Gudui are identical to those of the residents living in the proposed project area.

b) Discuss any similar options that are occurring:

Because the income of the local people is very limited, the target families cannot afford to purchase the new FCS unless they receive outside financial support. In the WPA project, WPA supplies all the cookstove investment, while the cookstove users assist during construction and buy the pots. The financial support from the WPA overcomes the investment barrier.

As the scale of the present WPA project (a total of 20 FCS) is quite small, most of the families will not enjoy the benefits of the FCS unless the project is expanded. There is no similar project or government plan to support the FCS. So the carbon revenue is essential to the implementation of the proposed project.

Conclusion

The barriers discussed above prevent the implementation of the project activity without carbon funding as well as alternative scenarios discussed. Therefore, the baseline scenario is the continued use of traditional cook instruments.

The project activity would not be implemented without carbon funds and is therefore additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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B 6.1.1. ER Calculation Method

The emission reduction (ER) is calculated according to CDM methodology AMS.II.G.

Equation 1

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

Where

ER_y	Emission reductions during the year *y* each household in tCO_2e
$B_{y,savings}$	Quantity of woody biomass that is saved in tonnes each household
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable biomass
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{project\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO_2/TJ[10]

B.6.1.2. Wood Reduction ($B_{y,savings}$)

As indicated in the methodology,

Equation 2

$$B_{y,savings} = \sum_{i=1}^{3} B_{old,i}\left(1 - \frac{\eta_{old,i}}{\eta_{new}}\right)$$

Where $B_{old,i}$ means the summary of the wood quantity used of part A1,A2 and A3 described in baseline introduction in section B4. The $B_{old,i}$ are determined by sample during baseline survey. The quantity of the firewood consumption is obtained by face-to-face interview. Since the local people have no clear idea about the weight of the wood is, number of wood bundles is used as a proxy measure. The mass of the wood bundle was weighted by the surveyor later on.

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

According to the sample guideline in the methodology, when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters.

The wood consumption of each family follows a normal distribution; the variance is unknown at the time of survey, so the following equation applies:

Equation 3

$$\frac{\overline{X}-\mu}{S/\sqrt{n}} \sim t(n-1)$$

Where
$\overline{x}$ is the even weight of wood consumption from the survey date
μ is the wood consumption of each family
S is the sample standard deviation
n is the sample number, 304 in this project
t (n-1) means Student Distribution with the degree of freedom (n-1)

The 90% confident interval is

Equation 4

$$\left(\bar{x} \pm \frac{s}{\sqrt{n}} t_{\alpha/2}(n-1)\right) \sim \left(16.305 \pm \frac{9.908}{\sqrt{420}} * 1.645\right) \sim (16.305 \pm 0.7953)$$

Where α=1-90%=0.1

After the analysis of the survey data, the 90% confident interval is (16.305±0.7953) with the margin of error is 4.879%， which is lower than required 10%, so we use the average value 16.305 tonne dry biomass of the sample as the final average wood consumption in this project.

B.6.1.3. Stove efficiency (η)

Table 3. Thermal Efficiencies of the Stoves

	TSF	**MS**	**FCS**
η	10%	10%	20%
Data source	Methodology default value	Methodology default value	Conservative value as similar report

TSF thermal efficiency takes the default value of 10% as dedicated in the methodology.

MS, which has neither chimney nor grate, is made by mud in a rough way. There is no air supply inlet in the stove. So the default thermal efficient of 10% is applicable to MS, as indicated in the methodology as the follows:

As indicated in the methodology, a default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney;

Given that the performance of the FCS depends largely on the skills of those who construct it, and given that the finial effect of the FCS of the proposed project needs to be proved, we take the most conservative value of 20% in our project, which meets the requirement in the methodology. The actual thermal efficiency of the FCS will be determined by Water-Boiling-Test after construction.

The wood saving of each stove in year y $B_{y,savings}$ is determined as follows:

Equation 5

$$B_{savings,y} = B_{old}\left(1 - \frac{\eta_{old}}{\eta_{new}}\right) = 16.305 \times \left(1 - \frac{0.1}{0.2}\right) = 8.1525 ton/year/house$$

B 6.1.4. Non-renewable Biomass Ratio ($f_{NRB,y}$)

Equation 6

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

Where,
NRB- Non renewable woody biomass
DRB-Demonstrably renewable woody biomass

According to the baseline survey, 99.8% of the respondents agree the **firewood gathering distance and time** is increasing and **type of firewood** has changed over time. In the past, it was common to fell a big tree for fuel. Now, smaller trees are typically used along with small branches and bush scraps. A survey by Mamize Reserve Protect Station shows that the diameter of the forest has diminished while the logging area has increased (see Annex 3 to the present document). For the MNR, this is clearly not a sustainable trend.

The biomass non-renewable ratio ($f_{NRB,y}$) is calculated as METHODOLOGY TO DIFFERENTIATE BETWEEN NON-RENEWABLE AND RENEWABLE BIOMASS[11].

[11] http://cdm.unfccc.int/public_inputs/emis_reduc4SSC_PA/cfi/U3FFP4DCVRZNRAT8IOUD9WB68ZCTM0

For the wood collecting area, the mean forest increment is 8,145 tonnes/year (Equation 7). Total wood consumption in baseline of 2,804 families was 49,878 tonnes/year while the project could reduce the woody biomass of 13,044 tonnes.

As the guideline, when the projected biomass consumption by the project (after the implementation of the project) (62,922-13,044=49,878 tonnes/year) > Annual Increment (8,145tonnes/year) , the project can claim all emission reductions from its fuel wood savings. So in the proposed project, all the wood biomass saved from the project could be seen as non-renewable biomass, which means

$f_{NRB,y}$=100%

At present, the logging industry is forbidden to undertake activities in the MNR. Given that other wood-consuming activities in the MNR are limited (e.g., house building), it follows that firewood cutting is the primary reason for the deforestation in the project area (NRB 1989 Prove). B_{Total} in this project could be replaced by the total wood consumption from the 2,804 families, which is also a conservative calculation method. The total wood consumption of each household $B_{Total,i}$ is calculated as the even value of the sample data, which composed by all the wood consumption includes categories of (I), (II), (III), (IV) and (V) described in B 4.1.

Mean annual increment is calculated using the following formula,

Equation 7

Mean annual increment (tonnes/year) = reachable forest area (in ha) * mean annual increment/ha (m3/ha/year) * average density of wood (tonnes/m3) =S*G*ρ=8,145 tonnes/year

Where:
G is the average growth rate of local forest, 1.87m^3/(ha·year).[12]

S is the wood collecting area used by all the 2,804 inhabitants within and near the project boundary. As local forest regulation, the firewood reserve forest area is fixed for each family. Woodcutting outside the firewood reserve area is completely forbidden now. S is 7,284ha according to the GIS (Geographic Information System) estimation, and the geography information from Leibo Forest Protect Bureau (see ***Square Calculation Statements***).

ρ is the dry mass density of the firewood. We use the largest density of the local tree of 0.598 tDM/m^3 as the conservative consideration. During the baseline survey, firewood species

[12] The Certification of Mamize and Yuexi Forest Stock-Growth Rate [R]. Liangshan, Liangshan Forest Inventory and Planning Institute. 2010:1.

include main hard wood， larch, birch and so on. The relevant densities are shown in the Table 5. [13]

Table 4. Densities of the Main Firewood Categories

Firewood Species	Density （t DM/m^3）
Larch	0.490
Miscellaneous tree	0.515
Birch	0.541
Hard wood	**0.598**

B.6.1.5. Emission Reduction (ER_y)

The ER per stove $ER_{unit,y}$ is calculated as follows:

Equation 8

$$ER_{unit,y} = B_{savings,y} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$$
$$= 8.152 \times 100\% \times 81.6 \times 0.015$$
$$= 9.978 tCO_2e$$

The total ER_y of the project of the 400 families is as follows:

Equation 9

$$ER_y = n1 * ER_{unit,y} = 400 \times 9.978 = 3991.2 tCO_2e$$

Baseline stoves continue to be used would be excluded in the calculation.

B.6.1.6. Leakage

ER_y should multiple a leakage factor of 95% as the methodology.

B.6.1.7. Emission reduction ($ER_{project}$)

The final emission reduction ($ER_{project}$) considering the leakage is calculated as following:

$ER_{project}$=ER_y*95%=3791 tCO_2e

[13] Guidelines for Carbon Accounting and Monitoring [M]. Beijing, China Forestry Press 2008: 63-64

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

(Copy this table for each data and parameter)

Data / Parameter:	$B_{y,savings}$
Data unit:	Tonne/year/house
Description:	*Quantity of woody biomass that is saved in tonnes*
Source of data used:	Baseline Report
Value applied:	8.1525
Justification of the choice of data or description of measurement methods and procedures actually applied	
Any comment:	

Data / Parameter:	$f_{NRB,y}$
Data unit:	%
Description:	*Fraction of woody biomass saved by the project activity in year* y *that can be established as non-renewable biomass*
Source of data used:	PDD
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied	See B 6.1.4. in PDD
Any comment:	

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

Data / Parameter:	$EF_{project\ fossilfuel}$
Data unit:	*tCO_2/TJ*[14]
Description:	*Emission factor for the substitution of non-renewable woody biomass by similar consumers.*
Source of data used:	CDM Methodology AMS.II.G Version 3.0
Value applied:	81.6
Justification of the choice of data or description of measurement methods and procedures actually applied	
Any comment:	

Data / Parameter:	η_{old}
Data unit:	%
Description:	Efficiency of the system being replaced
Source of data used:	Baseline Report
Value applied:	10%
Justification of the choice of data or description of measurement methods and procedures actually applied	Default value in methodology
Any comment:	

Data / Parameter:	**N**
Data unit:	
Description:	Quantity of all the households in the three targeted towns
Source of data used:	Official Estimate
Value applied:	1,632
Justification of the choice of data or description of measurement methods and procedures actually applied	This parameter is used to calculate the total firewood cutting from the wood collecting forest area. Please See ***Square calculation statements***
Any comment:	

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

Data / Parameter:	**S**
Data unit:	ha
Description:	The area of wood collecting area of all the 2,804 surrounding inhabitants within and nearby the project boundary.
Source of data used:	Mamize Reserve Protect Station
Value applied:	7,284
Justification of the choice of data or description of measurement methods and procedures actually applied	Details please See ***Square calculation statements***
Any comment:	

Data / Parameter:	**G**
Data unit:	m^3/(ha·year)
Description:	Average grow rate of local forest
Source of data used:	The Certification of Mamize and Yuexi Forest Stock-Growth Rate
Value applied:	1.87
Justification of the choice of data or description of measurement methods and procedures actually applied	The date if from the most recent research of Liangshan Forest Inventory and Planning Institute. See annex 2 to the present document.
Any comment:	

Data / Parameter:	**ρ**
Data unit:	tDM/m^3
Description:	Dry mass density of the firewood
Source of data used:	The Certification of Mamize and Yuexi Forest Stock-Growth Rate
Value applied:	0.598
Justification of the choice of data or description of measurement methods and procedures actually applied	Use the largest density of the local tree for the purpose of conservative.
Any comment:	

Data / Parameter:	$B_{Total, i}$
Data unit:	Tonne/year/house
Description:	*Quantity of total woody biomass consumption per family in the baseline*
Source of data used:	Baseline Report
Value applied:	22.44
Justification of the	

choice of data or description of measurement methods and procedures actually applied	
Any comment:	

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

B.7.1 Data and parameters monitored:

Data / Parameter	η_{new}
Unit	%
Description	The thermal efficiency of the FCS
Source of data	Onsite measure
Value(s) applied	
Measurement methods and procedures	National Standard: NY/T 8-2006 "Thermal performance test method for civil firewood stoves" would be followed for stove test. The sample would follow the latest CDM guidance *General guidelines for sampling and surveys for small-scale CDM project activities*.
Monitoring frequency	Annually
QA/QC procedures	The efficiency would be test by Kangmei and rural energy expert. The sample scale would follow 10/90 precision
Purpose of data	
Additional comment	

Data / Parameter	n1
Unit	
Description	The quantity of FCS under usage. 400 was used ER calculation in PDD. And the dismantled MS in the baseline should be record and surveyed during project monitoring as B.2.3 and GS Passport.
Source of data	Onsite survey
Value(s) applied	
Measurement methods and procedures	Household stove-check if the stove is under normal usage by sample. The sample would follow the latest CDM guidance *General guidelines for sampling and surveys for small-scale CDM project activities.*
Monitoring frequency	Annually
QA/QC procedures	The sample scale would follow 10/90 precision
Purpose of data	
Additional comment	

B.7.2. Description of the monitoring plan:

B.7.2.1. Stove Efficiency

The carbon-relevant monitoring jobs of the project are managed by *Kangmei Institute of Community Development and Marketing*.

Table 5. Project implementation Structure

Content	Responsible part
Stove construction management	Kangmei Institute of Community Development and Marketing, WWF Chengdu Programme Office
Carbon development	South Pole Carbon Asset Management Ltd.
Monitoring plan implementation	Kangmei Institute of Community Development and Marketing

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

In the proposed project, the efficiency and the using rate of the cook stove will be studied by sample annually to guarantee the FCS is working in good condition. At the same time, **Kangmei** and the local manage team will respond to issues related to cook stove maintenance during the usage of local families.

B.7.2.2. Leakage

In the event that people outside of the project boundary who previously used renewable energy sources use the wood saved in the project, B_{old} should multiple a leakage factor of 95% as the methodology.

B.7.2.3. Replaced instruments

Monitoring shall ensure that the replaced low efficiency appliances are disposed of and not used within the boundary or within the region.

As MS and TSF cannot be moved, and the replaced old MS must be dismantled before building up the new ones (due to the limit indoor space), the chance of leakage caused by the displaced

low efficiency appliances is quite small. The dismantling of the MS shall be recorded and monitored during the construction process.

B.7.2.4. Monitoring stove construction

Because the project could last as long as two years and the FCS will be put into use progressively as the construction process, the stove onsite construction progress must be well monitored and recorded. The informations such as FCS construction start date, employing start date, the FCS location and the fate of MS for each family shall be recorded by Kangmei.

B.7.1.5. Data archive

The local management team and Kangmei shall establish a data archive (electronic database) once construction starts. The database will include the identification of the stove user, and the dates when the FCS is finished and put into use. The monitoring information (e.g., efficiency check of the FCS) shall be recorded in the database.

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

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

>>

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:

>>

18/10/2011 when the first FCS construction starts could be seen as the start date of the project implementation.

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

>>

10 years

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:

>>

The project start date is the time when the first FCS is put into use or 2 years before the project is registered in the Gold Standard, 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:

>>

The FCS project is not required for any environment impact assessment in China.

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:

>>

There is no evident negative environmental impact from this kind of project.

SECTION E. Stakeholders' comments

>>

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

>>

Two local stakeholder consultation meetings were held in Dagudui village, located within the project boundary, on 16/10/2010 and in Qingkou town on 14/02/2012. In attendance were 85 participants: local villagers, the Mayors of Gudui , Changhe and Qingkou town, WWF Chengdu officer and other NGO staff. All were invited through public poster, oral invitation, email and phone call before the event.

During the meeting, the new cookstove was introduced, both verbally and visually. The meeting organiser went through the GS Environmental Impact and Do No Harm assessment. During an open discussion session the benefits and potential risks of the project were discussed. Participants were asked to produce questions and provide suggestions for improvement of the project.

Every participant filled in an Evaluation Table at the end of meeting.

E.2. Summary of the comments received:

>>

No negative opinions about environmental impacts, cooking habits, threats to biodiversity and health risks were received during the stakeholder-consulting process.

Most people realised the socio-economic and environmental benefits of the new cookstove (e.g., improving the environment, protecting the forest, protecting health, reducing workload associated with firewood gathering, etc.).

Some of the participants provided suggestions in the evaluation form (e.g., the project should start as soon as possible; every family in the target area should get a new FCS).

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

>>

1. As per comments, the project will cover the families in the target area as much as possible.

2. The project shall start on-site construction as soon as initial preparations are complete.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

1. The Certification of Mamize and Yuexi Forest Stock-Growth Rate

2. Baseline Survey Questionnaire

Annex 3

MONITORING INFORMATION

1. Stove User Distribution of the Project

Town	FCS Number
Gudui	200
Changhe	130
Lami	70
Total	400

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