The Gold Standard
Premium quality carbon credits

THE GOLD STANDARD:
Project Design Document for Gold Standard Voluntary Offset projects

(GS-VER-PDD)

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Explanatory information on how to complete the PDD and how to obtain Gold Standard registration can be found in the project developer's manual available on the Gold Standard website.

This template of the PDD is applicable for micro-, small- and large-scale projects. Note that the shaded boxes present information on the Gold Standard VER project development procedures. Project developers should delete these shaded boxes when preparing their PDD.

VOLUNTARY OFFSET PROJECTS

PROJECT DESIGN DOCUMENT FORM (GS-VER-PDD)
Version 01 - in effect as of: January 2006)

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity

Title: Gyapa Improved Cook-Stoves in Ghana
Version: 4
Date: 10 June 2010

A.2. Description of the project activity

In 1990, Ghana had 8.2 million hectares of high forest most of which today only 1.2 million hectares remain. The deforestation is caused mainly by slashing and bush clearance for agriculture, logging, bushfires, and unsustainable harvesting of fuelwood, including charcoal production[1]. This situation has been worsened by the ever increasing demand for charcoal with increasing oil prices. Unlike previously when most wood supply for charcoal production was from off-reserve sources, increasingly, the forest reserves are also being exploited for illegal charcoal production in Ghana.

At the current level deforestation of 2%, Ghana's level is among the highest in Africa, with current levels of wood-fuel consumption far exceeding forest growth. Wood-fuel cooking is therefore giving rise to green house gas emissions as well as significant health risk.

Wood and charcoal are the predominant cooking fuels in Ghana, providing more than 80% of domestic energy consumption. Charcoal is used by approximately 1.3 million households or 31% of all families in Ghana and in the capital city Accra, about 70% of households are using charcoal for cooking. Charcoal production is the only energy subsector where the cooking appliances and most production equipment are produced locally

Charcoal is produced from inefficient kilns with a carbonization ratio of about 8 tonnes of wood to 1 tonne of charcoal. These kilns are themselves responsible for high emissions of greenhouse gasses[2].

The project is initially focussed on the replacement of traditional charcoal stoves with very low efficiencies (locally known as "coal-pots") with an improved stove, known as the Gyapa[3]. The Gyapa differs from the coal-pot by virtue of having a combustion chamber which is heavily insulated with a ceramic liner.

Three sizes of charcoal-burning Gyapa are distributed by the project. Table **A.2-1** below shows the

[1] http://www.katoombagroup.org/documents/events/event18/NCRCsustainablecharcoalSept08.pdf

[2] *Charcoal in Africa Importance, Problems and Possible Solution Strategies* Dr. André Seidel Eschborn, April 2008 GTZ – HERA http://www.gtz.de/de/dokumente/gtz2008-en-charcoal-in-africa.pdf Page 7: "In addition, charcoal quality is rather low and efficiency is only between 8 and 15 %". Page 13: "One cause of the problem is the use of traditional kilns with very low efficiency which may require as much as 10 kg of wood for 1 kg of charcoal". While an estimate of wood:charcoal ratio is presented here as an indication, the emission reduction calculation method used by this project does not depend on any such estimate. Instead, it is based on field measurements published in the paper *Emissions of greenhouse gases and other airborne pollutants from charcoal making in Kenya and Brazil*, David M. Pennise,Kirk R. Smith, Environmental Health Sciences, University of California, Berkeley, California. Journal of Geophysical Research Vol 106 October 27 2001. The application of the measured values results in more conservative estimate of upstream emission reductions than the simplistic approach of treating each kg of carbon as if it were eight (or indeed, six) kg of wood combusted.

[3] The project will encompass savings made from efficient stoves using firewood in future years as detailed in the monitoring plan.

dimensions and application of the three Gyapa sizes as currently sold.

Table A.2-1: Gyapa Stove Sizes, Dimensions and Applications

Stove Size Description	Dimensions (cms)		Typical Application
	Height	Top Diameter	
Small	21.0± 0.5	26.5 ± 0.5	Mostly for domestic use
Medium	25.0 ± 0.5	32.0 ± 0.5	Commonly used for both domestic and non domestic (commercial or institutional) applications
Large	38.5 ± 0.5	47.5 ± 0.5	Exclusively used in non-domestic (commercial or institutional)applications

Fuel consumption tests carried out in Ghana have showed that the Gyapa cook stoves, regardless of whether the stove is used for domestic or non-domestic applications, use less charcoal fuel than the traditional "coal pot" stove in Ghana. Kitchen Tests carried out in November/December 2008 show that Gyapa reduces charcoal consumption significantly.

In a sample of 128 (18 small domestic Gyapa users, 80 medium domestic Gyapa users and 30 medium and large Gyapa non-domestic users) randomly selected users, the following average savings were realised from using Gyapa stoves:

- 0.25 kgs per stove per day for small domestic Gyapa stoves
- 0.51 kgs per stove per day for medium domestic Gyapa stoves
- 3.81 kgs per stove per day for medium and large non-domestic Gyapa stoves

This represents a significant reduction in wood demand for charcoal consumption and a reduction in the green house gas emissions arising from charcoal production as well as its use in kitchens.

Table A.2-2 shows the expected volume of sales of high efficiency stoves integrating all the three sizes (small, medium and large) and two applications (domestic and non-domestic) throughout the project period. The table calculates "operational stove years" by assuming an even rate of installation through the year. Operational stove-years are an important concept, since GHG emission reductions are dependent not on the sale of an improved stove for use in a kitchen operating an inefficient stove, but rather they are dependent on the number of months or years the improved stove is in daily use. An improved stove working for six months qualifies as 0.5 operational stove-years.

Table A.2-2 assumes that the Gyapa stoves have a 3-year working life .This assumption is not made by the monitoring protocol of the project, which requires that actual usage drop off rates are measured during project operation.

Currently inefficient and polluting cooking regimes are deeply established in the culture. The project aims to break this mould and move large populations away from conditions under which GHG emissions are unacceptably high, and health effects are unacceptably inhumane, for the women and children spending long hours each day in conventional kitchens.

Enterprise Works Vita (EWV) is the distributor of the project stoves in Ghana, and has ownership of the brand name Gyapa. EWV manufactures and distributes, also combining the functions of Gyapa promotion with technology development (to further improve efficiency and further reduce GHG and health-related emissions) and quality assurance supervision, on the basis of carbon finance. The quality assurance strategy has the potential to introduce a new set of quality expectations amongst consumers and so shift the critical mass of prevailing practice away from inefficient cooking with its extreme environmental and health penalties, to a new mass prevailing practice involving significantly reduced GHG emissions and healthier kitchens.

Table A.2-2: Projected Stove sales and Operational Stove Years

Calendar Year	Project Year	Sales	Expiries	Number of users by year end	Projected operational stove years	Emission Reductions tonnes CO2	tonnes of wood saved
2008	Year 1	12,000	0	12,000	6,000	6,477	7,709
2009	year 2	70,000	0	82,000	47,000	50,735	60,386
2010	Year 3	75,000	0	157,000	119,500	128,997	153,534
2011	Year 4	80,000	-12,000	225,000	191,000	206,179	245,397
2012	Year 5	80,000	-70,000	235,000	230,000	248,278	295,504
2013	Year 6	80,000	-75,000	240,000	237,500	256,374	305,140
2014	Year 7	80,000	-80,000	240,000	240,000	259,073	308,352
Total		**477,000**			**1,071,000**	**1,156,112**	**1,376,021**
Average				Annual average	153,000	**165,159**	

The sustainability matrix presented below assesses the project in terms of environmental and sustainable development impact. The pertinent indicators are:

Air quality: Mothers and children will be exposed to fewer hazardous air pollutants through reduced emissions of carbon monoxide and fine particulate matter[4]. Air pollution from cooking with solid fuel is a key risk factor for childhood pneumonia as well as many other respiratory, cardiovascular, and ocular diseases. Refer to Indoor Air Pollution Monitoring Summary for EnterpriseWorks-Ghana's Gyapa Wood Stove Project prepared by: David M. Pennise, Ph.D.Center for Entrepreneurship in International Health and Development School of Public Health University of California Berkeley, CA 94720-7360 USA 25 April 2006; WHO 2007, Indoor Air Pollution: National Burden of Disease estimates"; and "Assessing the Spread of Improved Charcoal Stoves in Urban Areas, Tanzania" by Tanzania Traditional Energy Development and Environment Organization-TaTEDO; http://sgp.undp.org/download/SGP_Tanzania1.pdf).

1. **Biodiversity** will be improved through the stove program reducing pressure on remaining forest reserves. Given that investigations of charcoal production methods have shown that 8 tonnes of wood are used on average to make 1 tonne of charcoal, and given the charcoal saved by a medium Gyapa was found in the samples surveyed to be 161 kg per year per stove (based on the lower bound of a 90% confidence interval), the corresponding wood saved per Gyapa sold, conservatively adjusted for statistical confidence, is found to be 1.3 tonnes/year.

   Table A.2.2 shows that the project is expected to achieve 240,000 Gyapa stove users implying average savings, conservatively assessed, of approximately 0.2 million tonnes of wood per year. The overall saving over the next seven years is 1.4 million tonnes; subsequent to these first seven years, savings should mount at the rate of 0.4 million tonnes a year or possibly more if the project over-reaches its goal.

2. **Employment.** The improved stoves give rise to employment opportunities for enterprises, manufacturing, distributing, retailing, and maintaining the stoves. EnterpriseWorks VITA (EWV) has 12 employees involved in the Gyapa dissemination project, of which 8 have been created on the strength of carbon finance since the project start in November 2007. There are 50 employees working in 4 ceramics factories making liners, and 91 tinsmiths engaged in stove manufacture in four regions. There are 253 registered retailers currently. A growth in all these numbers of at least 20% is expected as production and sales grow over the next three years. The

[4] See Prof. Kirk-Smith website; http://ehs.sph.berkeley.edu/krsmith/page.asp?id=1.

company's success stimulates competition which indirectly creates more jobs. The Table summarises jobs created, the skills requirements for the jobs and the level of employment:

Job Title	Skills Required	Level of Employment By Project
EnterpriseWorks Vita-Ghana		
Executive Director	Technical and project management, Project monitoring (as per PDD)	Partially up to about 10% of total time
Component Program Manager	Technical (design, fabrication), implementation, QA and project management, Project monitoring (as per PDD)	Partially up to about 40% of total time
M & E Specialist	Project monitoring and evaluation, Project monitoring (as per PDD)	Partially up to about 30% of total time
Project officers	Project management, implementation, monitoring and reporting. Extension services, Project monitoring (as per PDD)	6 staff were fully employed by the project in November 2007, and the number keeps increasing with expansion of the project into new regions
Drivers	Driving and basic project monitoring	2 drivers were fully employed by the project in November 2007, and the number keeps increasing with expansion of the project into new regions
Supply Chain		
Ceramists	Pottery and clay formulation, Business	4 ceramists (with 50 employees) established in November 2007. More Ceramists to be recruited with market expansion
Tinsmiths	Tin sheet and metal fabrication and joinery, tin metal spraying, Business	91 tinsmiths engaged in stove manufacture and number continues to grow with market expansion
Liner distributors and stove retailers	Business	2 liner distributors and several stove retailers established

3. **Livelihood** of the poor. The circumstances of poor families will be improved since the stoves reduce fuel costs. With the price of the medium size Gyapa at 5.12 Euros[5], and fuel savings assessed at 161 kg a year, the current price of charcoal in Accra being about 12.3 Euros cents/kg, and the stove lifetime of 3 years, the financial saving for charcoal users in Accra can be expected to be Euros 19.80 per year or greater. In the case of wood stoves, the reduction in wood consumption in rural areas implies relief from drudgery and more opportunity for productive activity, arising from less time spent collecting fuel.

4. **Access to energy services**. The improved stoves require less fuel, which in many areas can be a very scarce resource or expensive to buy; also the stoves are found by users to be more convenient, shortening the cooking time.

5. **Human and institutional capacity** is raised through the business development component of the project. The challenge of moving into areas such as large-scale promotion and advertising matched by quality control and branding initiatives, together with the introduction of improved production and accounting systems, is already having a positive effect.

[5] One Euro in late May 2008 was equivalent to GH¢1.55

6. **Technological self-reliance**. The introduction of locally manufactured technology with optimized energy efficiency helps to build technological self-reliance. The project has introduced specialist skills in ceramics, involving careful mixing of the ingredients of the stove insulation liners and the associated kiln construction and kiln operation skills.

No negative indicators arise from the project activities and an overall score is achieved as follows:

Sustainable Development Matrix	**Score (-2 to 2)**
Asterixes denote monitored indicators	
Local/Regional/global environment	
Water quality and quantity	
Air quality*	1
Other pollutants	
Soil condition	
Biodiversity	1
Sub-total	*2*
Social sustainability and development	
Employment*	1
Livelihood of the poor*	1
Access to energy services*	1
Human and institutional capacity*	1
Sub-total	*4*
Economic and technological development	
Employment (numbers)	
Balance of Payments (sustainability)	
Technological self-reliance*	1
Sub-total	*1*
TOTAL	7

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)**
The project is voluntary: no Kyoto party participates	EnterpriseWorks/VITA (EWV)	The project is voluntary: no Kyoto party participates
	J.P. Morgan Ventures Energy Corporation (The legal entity)	

The project is being implemented in Ghana but as a voluntary carbon project. As such, a formal host country approval is not required. However, the Ghana DNA has been officially informed of the project and was a participant in the Main Stakeholder Consultation meeting on the project, where the Ghana Government's approval of the project was recorded in the minutes.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The project started with the dissemination of improved charcoal stoves primarily in Accra and Kumasi cities and plans to expand sales throughout the country. The two leading cities of Ghana where the projected started are located in the Greater Accra region and Ashanti region, respectively[6].

A.4.1.1. Host Party(ies):

The project is voluntary and therefore is not hosted or invested in by a Party to the Kyoto Protocol

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

The following regions[7] of Ghana will be covered by the project:

1. Greater Accra
2. Central
3. Western
4. Ashanti
5. Eastern
6. Volta
7. Brong-Ahafo
8. Northern
9. Upper West
10. Upper East.

[6] http://ehs.sph.berkeley.edu/krsmith/page.asp?id=1http://ehs.sph.berkeley.edu/krsmith/page.asp?id=1

[7] See the map of Ghana showing all the countries regions where the project will be implemented

Figure A.2-1: Map of Ghana and the Project Regions

.A.4.1.3. City/Town/Community etc:

Initially Accra, Kumasi, and then later to other cities, towns, peri-urban, and rural areas of Ghana located in the 10 provinces listed above.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

EnterpriseWorks/Vita-Ghana (EWV-G), the country office of EnterpriseWorks/VITA (EWV), an international non-profit organization based in Washington, DC, USA, is the implementing organization and will conduct the project from its offices in Accra.

Contact Person(s): Atsu Titiati
Director
EnterpriseWorks VITA / Ghana EWV/G

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House No. C1200/12, Ebony Junction, Dzorwulu
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Cantonments, Accra

Phone: +233 -21-221406

+233 -24-4759435
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atsu@africaonline.com.gh

A.4.2. Size of the project:

Large-scale (the CO_2e savings are greater than 60,000 tonnes/year on average)

A.4.3. Category(ies) of project activity:

A.2. Domestic Energy Efficiency

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The project reduces the amount of green house gases (GHGs) emitted through production and use of charcoal and firewood as cooking fuels, by introducing widespread use of efficient charcoal and wood stoves (including those used by institutions such as schools) which replace existing inefficient stoves.

Carbon finance was identified in March 2007 as the only feasible method of reversing a sales decline, and up-scaling dissemination of the Gyapa stoves. This followed a series of attempts to scale up or re-introduce the project starting from the project inception in 2002. The chronology of the events starting from this date is shown in Annex 7_Chronology of Project Events.

As shown in the Annex 7_Chronology of Project Events (Separate Document), the project was started in 2002 without any intention of using carbon financing. However, after several attempts to make the project self-sustaining through the sale of stoves and several short term project funding by Shell Foundation, USAID, EPA and EWV resources, it was realised that a long term financing arrangement was required. This was in early 2007 when EWV started exploring the possibility of using Carbon Financing which culminated in a Term Sheet being signed in June 2007 and a VERPA which was signed in October 2007.

The UNFCC approved "Tool to for the demonstration and assessment of additionality" (Version 5.2) has been used to demonstrate additionality of this project. The 4 steps (See Figure A.4.4-1 below) provided for by the tool have been applied as follows in order to demonstrate and assess additionality of the project:

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

Sub Step 1a: Define alternatives to the project activity

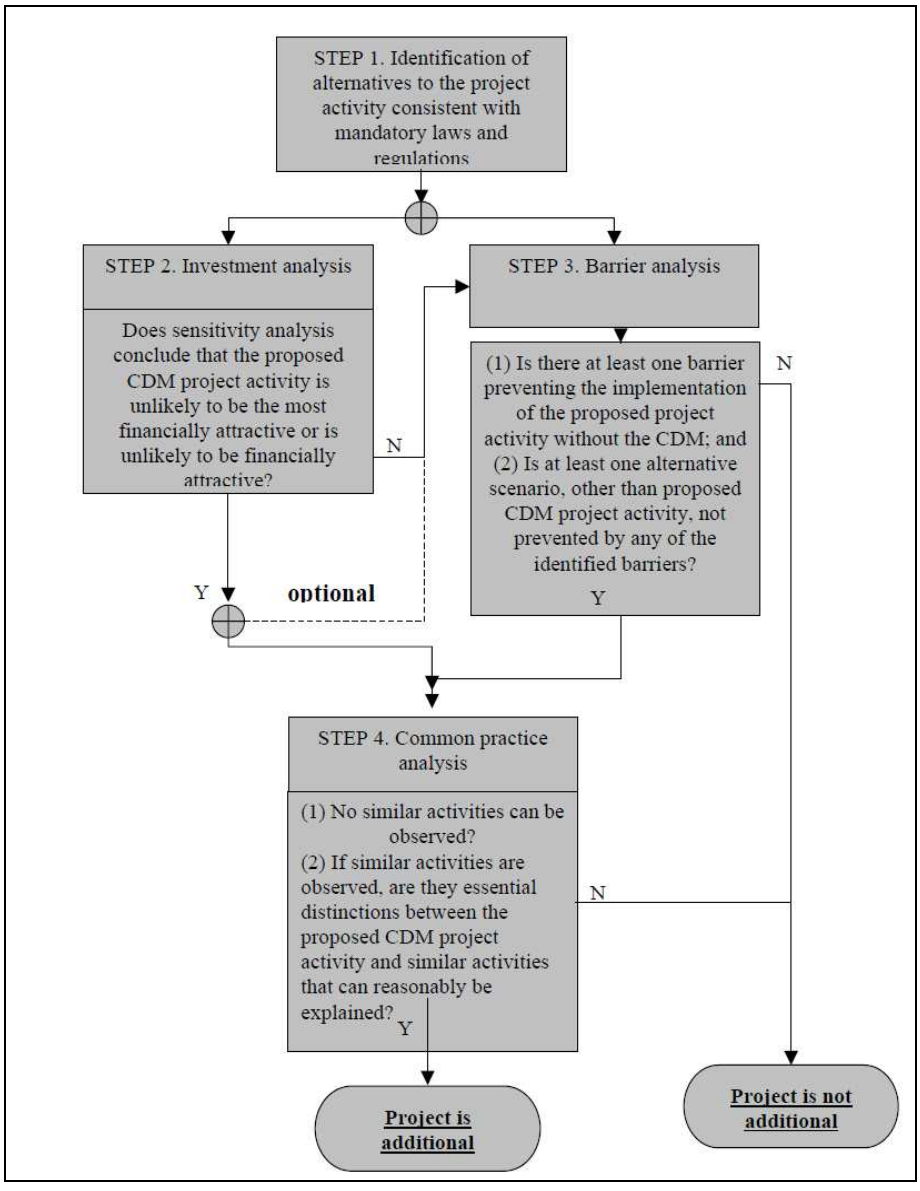
The following have been identified as realistic and credible alternative(s) to the project that provide outputs or services comparable with the proposed CDM project activity:

1. The proposed project activity undertaken without being registered as a CDM project activity
2. Energy delivered at household level through liquid fossil fuels such as LPG
3. Energy delivered at household level through electricity
4. Continuation of the current situation (no project activity or other alternatives undertaken)

Sub Step 1b: Consistency with mandatory laws and regulations

There are no laws in Ghana mandating the use of energy efficient charcoal stoves, LPG or electricity for domestic application. The project activity and the 4 alternatives identified in Sub-step 1a above are therefore not mandated or forbidden by any law in Ghana. They are all in compliance with Ghana legislation and regulations, in general.

Figure A.4.4-1: The 4 Steps for Demonstration and Assessment of Additionality



Step 2: Investment Analysis

The "Tool to for the demonstration and assessment of additionality" (Version 5.2) allows for alternative application of Investment Analysis or Barrier Analysis. In this project Investment Analysis has not been used.

Step 3: Barrier Analysis

In this section it is determined that the proposed project activity faces barriers that:

1. Prevent the implementation of this type of proposed project activity; and
2. Do not prevent the implementation of at least one of the alternatives.

Sub Step 3a: Identify barriers that would prevent the implementation of the proposed project going ahead without carbon finance.

Investment Barriers

In order to achieve rising sales for the Gyapa, considerable investment is needed. Examples of investments needed are:

1. Training for ceramicists and tin-smiths;
2. Quality control and assurance activities
3. Recruitment, training, and operational costs of project staff
4. Public marketing using TV, bill-boards, etc
5. Travelling demonstrations and sales campaigns
6. Credit facilities
7. Working capital
8. Transportation costs

Usually, for any business venture, the associated cost related to activities shown above is normally transferred to the user by being included in the final price of the stove. In the proposed project, if the true costs of the above were included in the retail price of the Gyapa stove, it would be unaffordable. According to a Policy Discussion Paper by the Global Policy Network on Incomes in Ghana (http://www.gpn.org/data/ghana/ghana-analysis.pdf), it is stated that "We can assess incomes in two ways – in absolute terms and in relative terms. In absolute terms, we can say incomes in Ghana are low because many households are not able to meet their basic needs with their incomes". The Mean Annual Household Income is given as US$ 1,462. This translates into A Mean Monthly Household Income of US$ 122 or a Mean Daily Household Income of US$ 4. The actual cost of producing and distributing Gyapa, including the costs associated with the above listed services that support the product, is US$ 18.9 for the large size, US$ 8.2 for the medium size and US$ 7.8 for the small one (See Table A.4.4-1 below for the product costing). But the proposed project design has enabled the retail price which is currently US$ 19.4 for the large size, US$ 5.6 for the medium size and US$ 4.9 for the small one, to remain at an affordable level.

Table A.4.4.-1 PRODUCTION COST PER A GYAPA STOVE AS AT November 2008			
Approx exchange rate	1.44	GHS to 1 USD	
RAW MATERIALS	**UNIT COST GH¢**		
	Medium size	Small size	Large size
Metal plate (scrap)	2.30	2.23	8.78
Ceramic liner	1.70	1.35	6.49
4 inches nails	0.10	0.10	0.38
Cement	0.25	0.23	0.95
Metal rods (flippers)	0.25	0.23	0.95
Paint	0.25	0.23	0.95
Production related Transportation	0.10	0.10	0.38
Stickers	0.10	0.10	0.38
Sand & wood ash	0.10	0.09	0.38
Labour cost/stove	0.20	0.20	0.76
Distribution (T&T)	0.15	0.15	0.57
TOTAL	**5.50**	**5.00**	**21.00**
USD	3.82	3.47	14.58
Wholesale price	7.00	6.00	25.00
USD	4.86	4.17	17.36
Base retail price	8.00	7.00	28.00
USD	5.56	4.86	19.44
Other cost			
Adverts	0.75	0.75	0.75
Demonstrations	0.50	0.50	0.50
Warranty Cards	0.15	0.15	0.15
User manual	0.10	0.10	0.10
Quality control	1.00	1.00	1.00
Market development/Business advisory services	1.00	1.00	1.00
EWV Overhead cost	2.75	2.75	2.75
Total	**6.25**	**6.25**	**6.25**
USD	4.34	4.34	4.34
Actual cost of stove with EWV support	**11.75**	**11.25**	**27.25**
USD	8.16	7.81	18.92

The carbon finance is effectively subsidising the cost of the stove to make it affordable by funding these business development, quality assurance and market creation costs. The funds to carry out these market creation and expansion activities could not be borrowed from standard financial institutions as the perceived risk would be too high for their lending criteria. Since EWV does not generate profits to enable it pay back a loan facility, it was established that carbon finance was the only credible market based option for raising additional capital for the development of this Project Activity.

According to a World Bank Study, *Supply and Demand for Finance for Small Enterprises in Ghana*[8], the overwhelming importance of *equity* finance in the start-up of small enterprises in Ghana is revealed, as in other countries, more so the smaller the enterprise such as the stove and liner manufacturers. On the other hand, credit for start-up is relatively rare. Banks do not normally risk lending to new investors, large or small, who do not have a track record. Many small entrepreneurs begin with very small amounts of capital from personal savings (their own and relatives' or friends') and steadily build up their enterprise by reinvesting profits. As firm size grows, the likelihood of obtaining external finance rises, although internal financing dominates even the largest size group in the survey. Due to the controlled and limited profits made by those involved in the Gyapa supply chain[9] capital build up for further investment is virtually impossible.

[8] http://www.worldbank.org/afr/findings/english/find26.htm

[9] See the web site http://www.enterpriseworks.org/pubs/May%2007%20Gyapa%20supply%20chain.pdf

Table A.4.4-2[10] below shows how major lenders do not provide start up capital to small scale entrepreneurs. The study concludes that "In conclusion, it is obvious that enterprise finance is an important barrier to the development of small and medium enterprises in Ghana, even after the introduction of the financial liberalisation in Ghana."

[10] This Table is from http://www.worldbank.org/afr/findings/english/find26.htm

Table A.4.4-b: Major Sources of Initial Finance and Working Capital by Firm Size

Table 1: Major Sources of Initial Finance and Working Capital by Firm Size (percentage of firms in each categoy listing response among top three)

	Sources of initial finance Number of workers				Sources of working capital Number of workers			
Source of finance	Total sample	1-9 Micro	10-29 Small	30-140 Medium	Total sample	1-9 Micro	10-29 Small	30-140 Mediur
Own savings	81	81	80	86	26	28	26	19
Profits	n.a.	n.a.	n.a.	n.a.	70	66	77	69
Relations	31	33	31	21	7	9	9	0
Bank loan	10	8	8	29	10	3	15	25
Overdraft	1	1	0	0	16	15	15	25
Supplier's credit	10	5	15	21	15	15	15	13
Advances	2	3	0	7	29	28	33	19
Special agency	7	11	3	0	11	13	8	6

Source: World Bank Report

Technological Barriers

1. Equipment

The production processes remain very ad hoc and hand-skill based, while systematic quality control to grow sales will lead to requirements for fabrication tools and templates, and new skills associated with their use (The DOE was able to observe this fact during the validation visit). Carbon finance will for example be used to assist ceramicists to invest in new equipment leading to the mechanization of the liner production process in order to improve quality. So far, the project has assisted both the ceramists and the fabricators to acquire hand tools (All contracted fabricators were issued with hand fabrication tools). Two ceramists were assisted to acquire semi automatic moulding machines and bigger kilns for the liners.

2. Skilled Labour

The proposed rise in sales will require training in a host of new skills, from new production techniques to management skills (Such training has been ongoing as explained under Annex 5). The training is meant to ensure product quality is maintained during project life. Nearly all the fabricators and ceramists have only small scale operations experience and were basically hands-on entrepreneurs. They have had no skills managing more staff, finance and material flow s which will be key for business expansion.

3. Technology risk

Users have to be convinced that the new stoves will make them financial savings whilst being suitable to use for cooking traditional foods.

The above listed technological barriers can be alleviated through additional cash injection to fund the acquisition of equipment, staff and create community awareness training.

EWV has prepared social marketing and adverting materials for effective awareness creation. Such efforts have also included product branding, prime time TV advisements and organising plays with messages in market places. As a result of the successful commercialisation, EWV won the prestigious 2009 PCIA Leadership Award (http://www.pciaonline.org/files/PCIA-Bulletin-Issue-19_revised.pdf).

See also http://www.pciaonline.org/node/139.

Barriers due to Prevailing Practice

Habitual use of traditional stoves imposes a very strong influence on the baseline scenario, resulting in continuation of use of traditional inefficient charcoal stoves. Inertia requires a significant amount of sensitisation, marketing, demonstration and personal anecdote to overcome[11]. The carbon finance will fund these activities which are required to shift the common practice from inefficient traditional stoves to improved ones under the Project Activity.

For example, some food tastes differently depending on the stove type used i.e. strength of the fire. There are foods which need to be cooked using "massive" fire while others need to be cooked using very low fires in order to maintain the "true" flavour of the final food.

Option 4 (the continuation of the current situation) does not face this barrier as it is the status quo.

Sub Step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The following three credible alternatives to the project activity were identified:

1. A switch to LPG for cooking
2. A switch to electricity for cooking
3. Continuation of the *status quo*

The first two face similar barriers as the project activity. In this section on Barrier Analysis, it has been shown that the economic barrier is biggest for electricity followed by LPG and experience has shown increasing use of charcoal and other biomass fuels in Ghana despite various interventions discussed above (See also Step 4 below). It has been shown the costs of switching to and continuing to use these fuels are even higher than with project scenario so are even less likely in the socio economic milieu in which this project operates[12].

[11] http://uneprisoe.org/RETs/GhanaCountryStudy.pdf, page 57 under section 4.2.3.2

[12] www.energyandenvironment.undp.org/undp/indexAction.cfm?module=Library&action=GetFile&DocumentAttachmentID=1628, page 4

The continuation of the *status quo* does not face any of the above barriers. People have been cooking on such unimproved stoves for many generations and they are the common practice.

While options 1 **(**The proposed project activity undertaken without being registered as a CDM project activity), 2 (Energy delivered at household level through liquid fossil fuels such as LPG) and 3 (Energy delivered at household level through electricity) also face investment barriers to varying degrees as discussed 4b, option 4 (Continuation of the current situation (no project activity or other alternatives undertaken)) does not face the investment barrier at all as it represents the status quo.

Step 4: Common Practice Analysis

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

There have not been any successful improved cook stove programs in Ghana that have sought to transform the cooking stove market in the way that the Project Activity does. There have been attempts to introduce improved cook stoves in the form of EWV/G (Gyapa) and World Bank (Ahebenso) interventions. Both were not successful as explained below.

EWV/G introduced and promoted the Gyapa in the period 2002-2005 on the basis of development finance. Key factors for successful scaling up were identified and documented (See http://www.hedon.info/TenTopTipsForSuccessfulScalingUp). The initial financing was provided by the Shell Foundation and USAID but only for a period[13]. However, the sustenance of these critical activities such as sales and market promotions and quality assurance require constant inflow of finance which cannot be provided through project finance which, by its nature, has an ending.

Since 2005, the finance was effectively no longer available[14], with the result that continuation of quality supervision, technology development, training and advertising was not possible for an expanding market. Clear indications existed that customers were not satisfied with unevenness in quality, with some manufacturers using inadequate ceramics for liners and cutting corners on cladding design leading to short lifetimes for the stoves.

EWV secured a small grant in 2007 from the EPA for 18 months primarily for investigation of an efficient wood-burning stove which reduces indoor air pollution (IAP) in rural areas, with secondary allocation to improved charcoal stove promotion. It also secured finance from the Shell Foundation, to assist with expansion in new geographic areas. Although these two sources of finance were helpful, they were both much too small and short in duration, in relation to the costs involved and the time it will take to establish a full market transformation. Further, this ancillary funding, by virtue of helping to expand the number of producers operating in different areas of the country, has exacerbated the need for an umbrella organization to provide quality control, as expansion without this element could quickly lead to quality problems, short-lived stoves, and customer disillusionment with the product.

Examination of sales figures in 2007 showed a 40% decline in sales since EWV ceased to operate in this role in late 2005. With the introduction of carbon finance (in the form of an advance from Climate Care[15] in 2007) and with the

[13] More material on this support is provided separately with this PDD

[14] A grant of $50,000 was deployed in the period Nov 2004 to March 2007, which allowed the project to be retained but was insufficient to expand the market or arrest a decline in quality management and in sales

[15] This advance was agreed in in June 2007 between EWV and ClimateCare and presented the opportunity (through projected carbon finance revenues) for the first time for a project that really could achieve the goal of customer confidence in quality, proper promotion, and longevity, through which market transformation could be achieved. While

two grants mentioned in 2007, EWV was able to re-start its earlier role of training new manufacturers, product promotion, quality control, and market expansion. The carbon finance has already played an essential role to promote expansion in late 2007 while underpinning it with the critical element of quality control. It is therefore evident from the above experience that a continuous and sustainable inflow of revenue is necessary for the proposed project to be sustained.

Carbon finance has been identified as the only realistic and adequate source of finance having the scale and consistency over time necessary to reverse the sales decline, expand significantly the sales of the Gyapa and maintain quality and customer adherence in the face of expansion of the number of producers and geographic reach. During 2006 EWV made extensive efforts to source longer-term and more substantial development finance for this purpose, from sources such as WB, GEF, DFID, with no success, and therefore it had become clear, when carbon finance was proposed in March 2007, that this was the only adequate funding source available.

Another similar option was the introduction of the Ahebenso stoves in Ghana. According to Hedon Household Energy Network (http://www.hedon.info/Ahibenso), the Ahebenso energy efficient stove was introduced in Ghana successfully by the World Bank using one large manufacturer who showed monopolistic tendencies. As a response, local artisans were trained to produce and commercialise the stove. It is reported that of all the 43 local artisans and engineering firms all over the country that were involved in the training, 15 were actively engaged in producing the Ahibenso on a commercial basis without any financial assistance from the Ministry concerned. They have to date produced and sold slightly over 2 ,500 Ahibenso stoves[16] and are innovative enough to design other sizes and improve parts of the stove. It is also more profitable for them to produce the Ahibenso stove. However they lack the capital to produce on the large scale (at least 50,000 units per year) needed to satisfy the market. It is proposed that subsequent programmes should address this issue by the provision of a revolving fund for artisans (http://www.hedon.info/Ahibenso-TheImprovedGhanaCoalpot; under "production". This kind of recommended fund can be through carbon financing.

The introduction and widespread adoption of an equivalent stove as the proposed project, requires substantial and sustained market and production support while maintaining the price affordable. Carbon financing can be used to achieve this intervention.

In addition, other international development agencies have run improved wood-burning stove programs in peri-urban and rural Ghana. These projects have been non commercial in nature and limited in scope. They have had little impact on the overall cooking market, which the Project Activity intends to transform over the coming years.

Step 4b: Discuss any similar options that are occurring

There is evidence, in Accra, that households who started to use LPG are using it less rather than more. The cost of LPG has put it out of the reach of the vast majority of householders. In a UNDP study entitled "Liquefied Petroleum

short-term aid grants continued to be procured (a necessity given the inevitable delay between carbon project start and issuance) and were augmented by advance purchases of carbon credits to help raise combined funding levels in 2008-9, the carbon finance prospect and payments evidenced by the June 2007 agreement, provided the essential basis for launching the project in November 2007.

[16] The proposed project aims to sell up to 80,000 stoves a year.

Gas (LPG) Substitution for Wood Fuel in Ghana – Opportunities and Challenges"[17], it is stated that "Presently, the Tema Oil Refinery (TOR) produces enough LPG locally to meet domestic demand, with surplus for export. A major setback identified at the introductory stages of promoting LPG use was the relative high upfront cost as compared to that of wood fuel. The LPG cylinder contributes significantly to this cost. The report further states that "It is worth noting that though the LPG Promotion Programme was successful in terms of general patronage and growth in the demand for LPG, its patronage was massively skewed to the urban areas. However, the level of LPG remained low even in the urban areas with a persisting high demand for wood fuel".

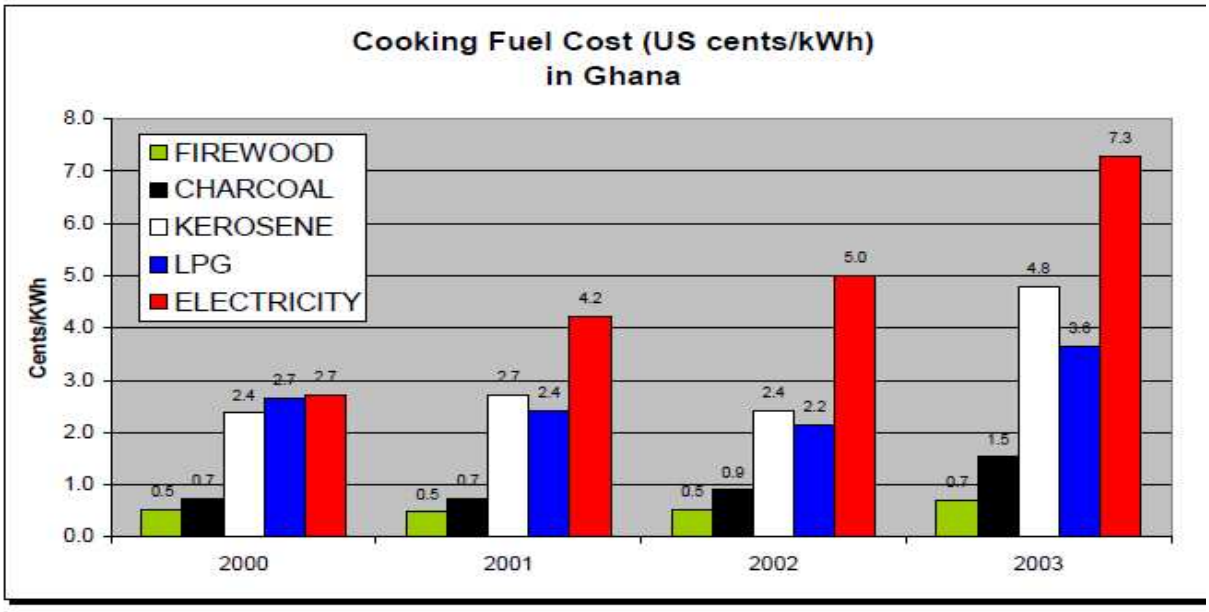
Frequent LPG shortages have also contributed to the use of charcoal as explained in the news item referenced on the website http://news.myjoyonline.com/business/200707/7020.asp. Widespread use of LPG among the target group is therefore not feasible in the likely life of the proposed CDM project.

There is also no evidence that people in this socio economic bracket are moving towards cooking with electricity. It is expensive, the distribution network is limited, the capital cost of an electric cooker is too high and the supplies are highly unreliable due to load shedding by the national utility.

On page 27 of the report "Ghana: Poverty and Social Impact Analysis of Electricity Tariffs (http://www.esmap.org/filez/pubs/08805GhanaPSIKeenerForWeb.pdf)", it is stated that "In Ghana, the potential for substitution to alternative fuels lies primarily in the fuel used for lighting, as for cooking most of the respondents already were at the "bottom of the energy ladder" using mainly charcoal or firewood, given the high relative cost of electricity for this purpose (Figure A.4.4-2 below). Outside of Ghana and large urban centers, use of LPG (gas) is unlikely given the higher cost of equipment required and limited availability. Of potential concern for the future of Ghana's wood resources is the comparatively low cost of wood next to electricity. On page 28 of the same report, it is shown that cooking with charcoal costs 1.5 US cents per KWhr while the same amount of energy when cooking with electricity costs 7.3 US Cents per KWhr.

The option of cooking with electricity is therefore not credible.

Figure A.4.4-c: : Comparative Cooking Fuel Costs



Source: KITE, 2003
mentID=1628)

Conclusion

Since similar activities cannot be observed in a similar scale as the proposed project, the project activity is additional.

Due to the explanations provided in this section, the credible baseline is the continuation of the current situation.

A.4.4.1. Estimated amount of emission reductions over the crediting period:

Table A.4.4.1

Project Year	Annual estimation of Emission Reductions in tonnes CO2e
-1	6,477
1	50,735
2	128,997
3	206,179
4	248,278
5	256,374
6	259,073
Total Emission Reductions (tonnes of CO2e)	**1,156,112**
Total Number of crediting years	7
Annual average over the crediting period of estimated reductions	**165,159**

SECTION B. Application of a baseline methodology

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

The project follows the methodology approved in January 2008 by the Gold Standard Foundation entitled "Improved Cook-Stoves and Kitchen Regimes". This methodology covers both the baseline and monitoring requirements for such a project.

The methodology applied also draws upon the Tool for the Demonstration and Assessment of Additionality; Version 05.

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology quantifies green house gas emissions from non-renewing biomass, and therefore applies to the project as there is clear evidence that the use of woody biomass and charcoal as cooking fuel is not balanced by the re-growth in the supply area.

The methodology is suitable for a project with a large supply area where very likely other projects may seek to quantify the non-renewing portion of the biomass consumption they save. By assessing non-renewability status in a fractional manner, the methodology assures that all projects in the same area are capped equally and there is no risk of double counting.

The methodology requires that surveys and quantitative measurements are carried out in the kitchens of the stove users. Since the fuel consumption reductions arising from the project will be sensitive to locally determined factors,

the application of a methodology requiring measurements in samples of households, as opposed to one dependent on lab testing of stove efficiency, is appropriate.

The following table summarizes how the project meets applicability conditions of the methodology as specified under "Section 1: Source and Applicability";

Methodology Applicability Criteria	Project Applicability Conditions
Programs or activities introducing improved cook-stoves and practices to households and institutions within a distinct geographical area.	The project introduces improved cook-stoves and practices to households and institutions within a distinct geographical area of Ghana (national boundary).
The project activity is implemented by a project coordinator who acts as a project participant.	The project activity is implemented by a project coordinator (EWV-Ghana) who acts as a project participant.
Low-emission cook-stoves and regimes replace relatively high-emission baseline scenarios.	The low-emission Gyapa cook-stoves and regimes replace relatively high-emission baseline scenarios (coalpot).
The project boundary can be clearly identified, and the stoves counted in the project are not included in another voluntary market or CDM project (i.e. no double-counting takes place).	The project boundary is clearly defined as users of branded Gyapa cook stoves manufactured and sold by EWV or their appointed manufacturers and distributors within Ghana with systems in place to track and reconcile manufacturing and sales. Furthermore, a check on information publicly available from other improved cook-stove projects in Ghana, to confirm absence of double-counting, is a monitoring requirement. The biomass collection boundary is Ghana.
The project is located in a single country	The project is located in Ghana
The improved cook-stoves do not number more than ten per kitchen and each have continuous useful energy outputs of less than 50 kW (defined as total energy delivered usefully from start to end of operation divided by time of operation)	Each household kitchen, in general, has maximum 2 Gyapa stoves. There was no case noted from the KS and KT where a kitchen had more than 5 stoves. The 3 stoves sizes have outputs less than 50 KW.

B.2. Description of how the methodology is applied in the context of the project activity:

In the context of this project, the basic assumptions of the methodology are that the green-house gas reductions arising from adoption of the Gyapa stoves can be determined conservatively as follows:

a) Emission factors for charcoal and wood combustion are the same in the case of baseline stoves and project stoves, and the most recent IPCC default values for these stove-fuel combinations are appropriate[18]
b) The green-house gas emissions arising from charcoal production are an important component of the baseline assessment and these are associated with credible and published emission factors derived from measurements made of similar techniques in similar localities[19]
c) The emission reductions resulting from sales of Gyapa stoves are conservatively assessed by a combination of two approaches[20]:
   i. applying a rigorous statistical analysis to the results of fuel-consumption sampling (Kitchen Tests or KTs) in households using a specific model of the Gyapa stove under a particular set of conditions,
   ii. making appropriate adjustments for application of these results to sales of other models used in alternative conditions, following the observations and analysis of a survey of 100 varied customers (the Kitchen Survey or KS)
d) The methodology prescribes a sequence whereby a Kitchen Survey is carried out in order that its results can be used to define customer groups (clusters) together with the characteristics required of subsequent Kitchen Tests (KTs) so that the customer groups may be represented by the tests. In this case the Kitchen Survey (KS) was carried out in February 2008 and the Kitchen Test was carried out in November/December 2008.

The Kitchen Survey and Kitchen Test investigated the commercial as well domestic applications of the Gyapa. Together these investigations recommended that the project calculates emission reductions for charcoal Gyapa stoves according to the following clusters:

a) Sales of medium size Gyapa charcoal stoves for domestic applications
b) Sales of small size Gyapa charcoal stoves for domestic applications
c) Sales of medium and large size Gyapas for non-domestic applications

The following leakage risks were investigated:

a) The 'rebound' effect. This is not a leakage risk as the KT measures actual fuel use in the kitchen with the improved stove, rather than applying a percentage saving to the baseline fuel use, with the attendant risk that the percentage saving was derived in a way that did not account for actual behaviour in kitchens.
b) The possibility of change in the fuel use behaviour during the project period is covered by the monitoring plan which also requires KTs to measure actual behaviour in kitchens on stoves which are older than a year.
c) The project activity might stimulate increased use of a high emission fuel either for cooking or for other purposes outside the project boundary (as would be the case for example if efficient cooking stimulated an increase in NRB consumption - possibly because the NRB fuel becomes cheaper due to the project activity). The annual estimated reduction in charcoal consumption from 160,000 Gyapa stove -users in 2010 (see Table A.2.2) is about 19,000 tonnes. This represents only 3% of the 667,000 tons current estimated annual consumption of charcoal in Ghana. This is not considered large enough to affect national charcoal prices and the likelihood of the leakage is discounted. By 2014, the growing effect of the project on NRB saving will

[18] The Methodology allows in Step 2.4 (section II part 4.2) for use of IPCC default values
[19] The Methodology allows for emission reductions from production of fuels (section II, Part 1)
[20] Statistical analysis is required by Step 2.3 (Section II, part 4.2) of the methodology and adjustments are allowed in the final paragraph of Step 1.5 (Section II, part 4.1)

be offset by increased demand from urban expansion and population growth, so again posing no risk of stimulating increased consumption of NRB. Furthermore, potential leakage of this sort (together with NRB fraction) is monitored annually.

d) By virtue of promotion and marketing of a new model and type of stove with high efficiency, the project might stimulate substitution of a cooking fuel or stove type with relatively high emissions by households who commonly using a cooking fuel or stove type with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline. A tendency was observed amongst LPG users to switch back to charcoal, but it was found there was as much reversion to coal-pots (inefficient charcoal stoves) as to Gyapas. Consequently the availability of Gyapas did not pose a risk of this sort, as those people switching to Gyapas would clearly have switched to cola pots had the Gyapa not been available. Also, the switch back tendency from LPG to charcoal was as a result of non-availability of LPG in the market and also increased cost of LPG and in that effected, the project did not initiate the switch back and without the project, those households switching back will have otherwise started using coal-pots or traditional stoves which produces more emissions compared with Gyapa[21].

e) The project population might compensate for loss of the space heating effect of inefficient cook-stoves by adopting some other form of heating or by retaining some use of inefficient stoves. There was no evidence of space-heating or other side-benefits of the coal-pots (inefficient charcoal stoves) causing this kind of risk. There was evidence of retained use of coal-pots, which was accommodated by the design of the Kitchen Tests during which subjects used secondary stoves following normal practice.

f) The traditional stoves displaced might be re-used outside the boundary in a manner suggesting more usage than would have occurred in the absence of the project. Due to the very inexpensive and ubiquitous availability of the coal-pots, and there not being scope for second-hand coal-pots effecting choice of cooking method, it was concluded that this was not a risk.

g) Significant emissions from transportation or construction involved in the project activity might occur, including emissions associated with production/transport of the efficient stoves themselves, or production/transport of project fuels. The amount of LPG (where used to fire ceramic liners)[22] was found to be 0.26 kg per liner on average with breakages, and pre-heating of kilns, taken into account, resulting is a CO2 emission of under 0.8 kgCO2 per liner, or less than 0.2% of the emission saving of each stove. The transportation of clay and stoves also is an insignificant portion of the emission savings, and in view of the equivalent or worse emissions associated with coal pot manufacture and transport, it was concluded that construction and transportation did not represent a leakage.

Thus, no leakage factor is applied.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered VER project activity:

In the case of domestic medium[23] stove users, the baseline study shows the average charcoal consumption of families sampled using the traditional stove was 1.6 kg per day, in typical conditions. Families in the sample moving to the medium size Gyapa charcoal stove and using it for the same purpose and thermal load (cooking meals of the same type, number and sizes) were found to reduce their consumption to 1.07 kg per day on average. The adoption of the improved stove therefore resulted in a saving of 0.5 kg of charcoal on average each day by each user (a 32% saving on fuel consumption).

[21] http://www.fao.org/docrep/003/y3198e/Y3198E05.htm

[22] Most of the liner manufacturers use saw dust to fire the kilns. Saw dust is renewable biomass and is carbon neutral.

[23] Domestic medium stoves constitute the bulk of the total Gyapa sales and serve to illustrate how anthropogenic emissions are reduced.

This conservative estimate of fuel saving of 0.5 kg (0.44 kgs at 90% confidence level as required by the methodology) per day for buyers of the medium size Gyapa for domestic application, translates to a green-house gas saving of 0.8 tonnes of CO2e per year per medium size Gyapa sold. This figure takes into account the actual conditions (including some parallel LPG and Kerosene use) under which Gyapas are used, as observed carefully during KS and KT procedures.,

Sales of small size and large size Gyapas have been relatively small during the first two years of the project and the projected emission reductions for all sales, as presented in this document, assume a similar pattern will continue through the project. Small Gyapas (exclusively domestic) were found in 2008 and 2009 to represent 12.0% of the total stove sales, domestic medium Gyapas at 78.8%, commercial medium 8.8%, and large (exclusively non-domestic) 0.5%.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The project boundary is defined as the kitchens used by the project population (Gyapa stove purchasers); this is distinct to the Reachable Fuel Collection Area, which is the geographical area of Ghana where fuel-woods can reasonably be expected to be collected throughout the period of the project.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

The baseline study was completed 10/5/08 and was carried out in several stages:

1. In February 2008 a Kitchen Survey was undertaken by EWV Ghana of a random sample of 100 households which had been Gyapa buyers in the preceding 6 months. The survey data was complied into a Findings report by Seth Mahu of EWV Ghana following which a combined report was produced including an analysis by Seth Mahu of EWV Ghana, Joash Obare of JP Morgan ClimateCare, Dr Adam Harvey of JP Morgan ClimateCare and Dr Tim Heaton of Oxford University Statistics Department, to determine a suitable design for Kitchen Tests. Dr Heaton also acted as an external assessor and made independent observations which confirm that the KS was an accurate reflection of conditions.
2. In November and December 20008, a Kitchen Test was conducted by Joash Obare and Tom Owino of JPMorgan Climate Care. These tests were carried out rigorously over a period of one month, allowing 2 weeks for each phase of the tests (pre-ICS and post ICS). The statistical analysis was provided by an independent expert from the University of Oxford.
3. The non-renewability fraction of fuel-wood in Ghana, was analyzed by Dr Adam Harvey of JP Morgan ClimateCare in May 2008 with further investigation carried out in November 2008.
4. Sustainable development indicators and leakage indicators were investigated during the Kitchen Survey in February 2008 and conclusions included the Kitchen Survey report.

The parties mentioned may be contacted through the project participants listed in Annex 1.

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:
1st November 2007

C.1.2. Expected operational lifetime of the project activity:
7 years 0 months

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

Renewable

C.2.1. Renewable crediting period

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

1st November 2007

C.2.1.2. Length of the first crediting period:
7 years 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date: N/A
C.2.2.2. Length: N/A

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

The monitoring protocol is included within the methodology "Improved Cook-Stoves and Kitchen Regimes", approved by the Gold Standard Foundation.

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The monitoring methodology has been developed in the context of this project activity. The applicable conditions are explained under section B.1.1 of this PDD.

D.2. 1. OPTION 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID #	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Accuracy/ Comment
1	*Stove Sales/Market Penetration*	*Sales Records*	*Number of stoves by type, size and region*	*C*	*Daily*	*All sales*	*Electronic and paper*	*100% accuracy*
2	*Project Fuel Consumption*	*KTs*	*Mass fuel per year*	*M*	*Biennial*	*Sample*	*Electronic and paper*	*90% confidence limit accuracy* *Fuel consumption of improved stove*
3	*Clustering definitions*	*Monitoring KS*	*As specified above*	*E*	*Quarterly*	*Sample*	*Biennial monitoring reports*	*To ensure representative KTs*
4	*Usage factor*	*Usage KT or KS*	*% operational*	*M, E*	*Biennial*	*Sample*	*Electronic and paper*	*+/-1%*
5	*Age Factor*	*Stove-age KT*	*Mass fuel per year*	*M*	*Biennial*	*Sample*	*Electronic and paper*	*+/-0.5 kg*
6	*New Stove performance*	*New Stove KT*	*Mass fuel per year*	*M*	*Biennial*	*Sample*	*Electronic and paper*	*+/-0.5 kg Fuel consumption of new improved stove*
7	*Market development*	*Company records and Quarterly Report*	*Sales trends, expenditure and number of activities on sensitisation and promotion*	*E*	*Quarterly*	*Major promotional activities*	*Electronic and paper*	*100% Accuracy On sales activities* *Sales trends and their correlation to promotions*

Note *
Fuel consumption test (KTs) may be undertaken more frequently for specific clusters to update the values used to calculate emission reductions.

D.2.1.2. Data to be collected in order to monitor project performance on the most sensitive sustainable development indicators:

ID #	Sustainable Development Indicator	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)
1	*Air quality*	*Survey*	*Air pollutants (CO, particulates)*	*PPM of CO and PM, and Survey observations*	*Estimated through home interviews, observations and measurements of CO and PM during surveys. The surveys are to be carried out biannually*
2	*Lively-hood of the poor*	*Survey*	*Financial impact*	*USD*	*Estimated through home interviews during quarterly Kitchen Survey visits to randomly selected Gyapa stove buyers*
3	*Employment*	*Survey*	*Numbers*	*Number of Employees*	*Direct employees and retailers of Gyapa stoves are measured and spin-off employment (competitors) is estimated*
4a	*Access to Energy Services*	*Survey*	*Ease of cooking, convenience, reduced fuel demand*	*Tonnes/year, prices, walking distances*	*Measured through kitchen tests and surveys*
4b	*Product quality*	*Spot checks*	*Key technical specifications and features*	*Number of spot checks per year per manufacturer*	*Each liner manufacturer and cladding shop will be visited at random intervals and a record kept of observations of key technical features.*
4c	*Exclusive usage*	*Survey*	*Fraction of customers*	*Number of users of inefficient secondary stoves*	*The Kitchen Surveys will record the extent to which customers continue to use an inefficient stove alongside*
5	*Human and institutional capacity*	*Survey*	*Skill levels*	*Number of people trained, Number of trainings conducted*	*Estimated through records of Gyapa stove and spin-off achievements in business, marketing, and technology areas* Records of trainings and number of people trained by EWV on the Gyapa technology
6	*Technological self-reliance*	*Survey*	*Achievement*		*Estimated though observation and record of Gyapa stove and spin-off technical innovations and developments*

D.2.1.3. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

The emissions reductions have been calculated using data from paired samples obtained from the KT (See Annex 6.2) as described in the Methodology for Improved Cook-stoves and Kitchen Regimes, Version 01 (with reference to Section 7 of Part II).

The methodology provides for direct calculation of the emission reductions using paired data without calculating the project emissions. This option has been applied as explained in Section E below.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
8	*Non-Renewable Biomass fraction*	*FAO, FOSA, Ghana Forestry Policy, Rural KS surveys*	*Xnrb: % non-renewable biomass*	*M, C, E*	*Biennial*	*Sufficient depth and conservative approach*	*National Data are electronic. Survey results are paper and electronic*	*Following approach of baseline assessment*
9	*Baseline Fuel Consumption*	*Monitoring, KT or New Stove KT*	*Mass fuel per year*	*M*	*Biennial*	*Sample*	*Electronic and paper*	
10	*Emission factor charcoal production*	*Literature search*	*Tonnes CO2e per tonne charcoal*	*M*	*Annual*	*As per source*	*Published literature*	*Valid when the new source improves on reference used at validation*
11	*Double-counting*	*Literature search*	*Credited ICS*	*e*	*Annual*	*Literature published and accessible on web*	*Published literature*	

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

The emissions reductions have been calculated using data from paired samples obtained from the KT (See Annex 6.2) as described in the Methodology for Improved Cook-stoves and Kitchen Regimes, Version 01 (with reference to Section 7 of Part II).

The methodology provides for direct calculation of the emission reductions using paired data without calculating the baseline emissions. This option has been applied as explained in Section E below.

D. 2.2. OPTION 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:
N/A

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):
N/A

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Al leakage risks		*KS*		*e*	*quarterly*		*Electronic and paper*	

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Qualitative assessment through quarterly Kitchen survey home visits throughout the project period

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The emission reductions have been calculated using the equations provided in Section 7 of the Gold Standard approved Methodology for Improved Cook-stoves and Kitchen Regimes, Version 01 as follows:

$$ER_y = \sum BE_{i,y} - \sum PE_{i,y} - \sum LE_{i,y} \quad \text{.....Eqn ER.1a}$$

Where,

ER_y	Emission reduction in total project population in year y (tCO_2e/yr)
$BE_{i,y}$	Baseline emissions of cluster i in year y (tCO_2e/yr)
$PE_{i,y}$	Project emissions of cluster i in year y (tCO_2e/yr)
$LE_{i,y}$	Leakage of cluster i in year y (tCO_2e/yr)

$$BE_y = X_{nrb,bl,y} \cdot B_{bl,y} \cdot EF_{bl,bio,CO2} + \sum(AF_{bl,i,y} \cdot EF_{af,CO2,i}) + \sum(\text{Non-CO2 emissions during cooking}) + \sum(\text{GHG emissions during production of the fuels}) \quad \text{.....Eqn B.1a}$$

BE_y	Baseline emissions in year y (in tonnes CO_2e per year) specific to cluster and Unit chosen.
$X_{nrb,bl,y}$	The non-renewable fraction of the woody biomass harvested in the project collection area in year y in the baseline scenario (See Annex 6.3: Wood-fuel Renewability Analysis).
$B_{bl,y}$	The mass of woody biomass consumed during cooking in the baseline in year y (tonnes/year).
$AF_{bl,i,y}$	The mass of alternative fuel i in the baseline in year y in accordance with trends projected throughout the project period, in tonnes. This mass has been set to zero since the KT is appropriately designed to subsume alternative fuels (approach 3).
$EF_{af,co2,i}$	The CO_2 emission factor for use of the alternative fuel i in the baseline in tonnes of CO2 per tonne fuel

and

$$PE_y = X_{nrb,pj,y} \cdot B_{pj,y} \cdot EF_{pj.bio,CO2} + \sum(AF_{pj,i,y} \cdot EF_{af,CO2,i}) + \sum(\text{Non-CO2 emissions during cooking}) + \sum(\text{GHG emissions during production of the fuels}) \quad \text{.....Eqn P.1a}$$

Where

PE_y	Project emissions in year y (in tonnes CO_2e per year) specific to cluster and Unit chosen
$X_{nrb,pj,y}$	The non-renewable fraction of the woody biomass harvested in the project collection area in year y in the project scenario (See Annex 6.3: Wood-fuel Renewability Analysis).
$B_{pj,y}$	The mass of woody biomass consumed during cooking in the project in year y (tonnes/year).
$EF_{pj.bio,co2}$	The CO_2 emission factor for use of the biomass fuel in the project scenario in tonnes CO_2 per tonne fuel
$EF_{af,co2,i}$	The CO_2 emission factor for use of the alternative fuel i in the project in tonnes of CO2 per tonne fuel

Within each cluster, the emission reductions are calculated thus:

$BE_{i,y} = N_{i,y} \cdot BE_{i,y}$ (ER. 1b)

$PE_{i,y} = N_{i,y} \cdot PE_{i,y}$ (ER. 1c)

Where

$N_{i,y}$ = the number of units in cluster i

Since the methodology allows for a derived emission reduction per unit basis, and since from the KT, the annual fuel savings (90% CI lower bound) per stove for each cluster can be determined, the above formulae have been modified to calculate the annual charcoal savings per stove-year.

Combining, the above three equations, and since the baseline fuel (charcoal) is the same as the project fuel, the emission reduction is then given by:

ERy = (Weighted average CO2e emission reductions per stove year). (Projected stove years)

as shown in Annex 1: Gyapa Emission Reductions_090325.

Based on the projected sales of stoves in each cluster, a weighted projected CO_2e reduction for all sales is calculated applying the IPCC specified default emission factors for the various gases and fuels (See Annex 1: Gyapa Emission Reduction Calculations_090325, Sheet: Detailed Prmtrs).

Using this approach, the emission reductions are then calculated as the product of the "a weighted projected CO_2e reduction for all sales" and "the stove/HH-years".

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

The project operator will employ a 3rd party expert with independent status and suitable credentials to ensure quality control in several of the monitoring activities. This consultant will be responsible for the local supervision and independent approval of periodic KS's, Usage Surveys, Leakage investigation, and spot-checks (including field observations of retailer activity) to confirm the validity of Sales Records and to confirm the absence of double-counting in any form. He or she will ensure that the Detailed Customer Database and the Project Database are up to date and that the latter is representative of the most recent definitions of clusters. He or she will cross-check the Sales Record with the sales records of retailers, and with production records (materials purchases, staff numbers), and with Gyapa stoves' internal accounting records. The 3rd party expert's reports on the methods used for such cross-checks (which will include a check that the Gyapa stoves counted under this project are distinctive in relation to any other cook-stoves counted under other carbon-financed projects within Ghana) and their findings will be included in quarterly monitoring reports available to the verifier. The project operator is responsible to fill this role to standard in any instances where a 3rd party is less suitable, unavailable or has been unable to do so.

Data *(All from Table 2.1.1)*	Data Variable	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	*Stove Sales*	*Low*	*Third party review (cross-checks as defined). Cross checks include reconciliation of sales, liner and stove production records*
2	*Project Fuel Consumption*	*Low*	*Third party review of KT results which are carried out according to internal protocol*
3	*Clustering definitions*	*Low*	*Conducted by third party and repeated periodically to track any changes over time*
4	*Usage factor*	*Low*	*Conducted by third party and repeated periodically*
5	*Age Factor*	*Low*	*Conducted by third party and monitored throughout the project*
6	*New Stove performance*	*Low*	*Conducted by third party during periodic KT*
7	*Market Development*	*Low*	*Conducted with third party assistance*
8	*Non-Renewable Biomass fraction*	*Low*	*Conducted by third party*
9	*Baseline Fuel Consumption*	*Low*	*Conducted with third party assistance*
10	*Emission factor charcoal production*	*Low*	*Conducted with third party assistance*
11	*Double-counting*	*Low*	*Conducted with third party assistance*

Data *(All from Table 2.1.2)*	Data Variable	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	*Air quality*	*Low*	*Third party review (cross-checks as defined). Periodic survey with air quality measurement using well established equipment and experienced consultants*
2	*Lively-hood of the poor*	*Medium*	*Third party review but results based on sampling and statistical significance.*
3	*Employment*	*Low*	*Actual direct employment records shall be maintained by EWV*

4a	*Access to Energy Services*	*Low*	*Conducted by third party but sales records captured and maintained by EWV. Sales data reconciled with liner and stove production data*
4b	*Product Quality*	*Medium*	*Random unannounced spot checks are made to each manufacturer by EWV*
4c	*Exclusive usage*	*Low*	*Third party review of Kitchen Surveys*
5	*Human and institutional capacity*	*Low*	*Conducted by third party but training records maintained by EWV*
6	*Technological self-reliance*	*Low*	*Conducted by third party*

Data items in tables contained in sections D.2.1 or D.2.2, as applicable.

D.4. Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The Project Operator and will schedule and implement the monitoring activities described and tabulated above, and summarize results in the form of quarterly monitoring reports (QMRs), due for submission within one month of end of each quarter. These QMRS will annex the prior reports of the 3rd party expert which will be due for submission within two weeks of the end of each quarter.

D.5 Name of person/entity determining the monitoring methodology:

The monitoring methodology is as prescribed in the methodology "Improved Cook-stoves and Kitchen Regimes" under the Gold Standard Foundation prepared by ClimateCare.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

See E6 below

E.2. Estimated leakage:

See E6 below

E.3. The sum of E.1 and E.2 representing the project activity emissions:

See E6 below

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline;

The equations used to calculate the baseline emissions associated are presented in the Methodology (with reference to Section 7 of Part II) and are resolved as follows for the charcoal stoves:

Ebaseline(per stove-year) = EF(nrb) x F(mean fuel consumption of stoves in cluster)

Where Ebaseline(per stove-year) is the CO2e emission associated with a single stove operating for one year, EF(nrb) is the sum of the charcoal emissions factors presented in table E.1(taking into account Xnrb), and F(mean fuel consumption KT traditional stoves) is the average fuel consumption of the old stoves sampled by the Kitchen Test.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

See E6 below

E.6. Table providing values obtained when applying formulae above:

Year	Project Year	Estimation of emission Reductions (tonnes of CO_2 e)	Estimation of Leakage (tonnes of CO_2 e)	Estimation of overall emission Reductions (tonnes of CO_2 e)
2008	Year -1	6,477	0.0	6,477
2009	Year 1	50,735	0.0	50,735
2010	Year 2	128,997	0.0	128,997
2011	Year 3	206,179	0.0	206,179
2012	Year 4	248,278	0.0	248,278
2013	Year 5	256,374	0.0	256,374
2014	Year 6	259,073	0.0	259,073
Total Emission Reductions (tCO2e)		**1,156,112**	0.0	**1,156,112**
Total Number of crediting years				7

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

No adverse environmental impacts will take place as a result of the project activity. During the stake-holder consultation in May 2008, the stakeholders (including representatives of Environmental Protection Agency of Ghana, the University of Ghana, and government in the form of the Ministry of Food and Agriculture, the Energy Commission and the Ministry of Energy) expressed the opinion that the environmental effects would be beneficial.

F.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:

N/A

SECTION G. Stakeholders' comments

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

Two levels of stakeholder consultations were conducted. At the early stages of the project, the first round of stake holder consultations was conducted by way of meeting while the second round (Stakeholder feedback round) was conducted through individual consultations after receiving the pre-feasibility assessment (See separate document ; ***Summary Report Consultations_Ghana Gyapa Stoves Project.pdf***)

The first stakeholder consultation meeting took place on 23 May 2008 in Accra. The meeting was advertised publicly and also personal invitations were issued. There were 30 participants of which 5 were representatives of

EWV Ghana and one represented JP Morgan ClimateCare. The 25 stakeholders were representatives of government, environmental and civil society organizations, academia and the private sector. Gold Standard Foundation was invited but did not attend (See separate document ; ***Stakeholder Consultations Report.pdf***).

After receiving the pre-feasibility pre-assessment and reviewing the issues raised therein and also those raised during the first stakeholder consultation, individual meetings were held with representatives of concerned organisations and the issues of concern and those raised in the pre-feasibility were resolved. In certain cases where EWV had already fully addressed the concerns, the representatives of the organisations were advised of the action taken (See separate document ***Agencies Consulted in the Gyapa Project Design Cycle.pdf***).

G.2. Summary of the comments received:

The primary comments and recommendations made by the first stakeholders were:

1. That the quality of the stove will be maintained so that it continues to deliver fuel-saving and health benefits
2. That the price is a low as possible to make sure that the stove reaches the largest market possible.
3. That the marketing is expanded to new regions, so that the carbon finance has the effect of reaching the most people possible.
4. The meeting fully endorsed the project and concluded that it the carbon finance was necessary funding. During the meeting, representatives of key government institutions such as the Ghana Energy Commission, Ministry of Energy, Ghana Environmental Protection Agency, KNUST, Ministry of Food and Agriculture, pledged their full support to the project.

During the second round of stakeholder consultations, the following additional issues were raised and resolved with the concerned individual organisations:

1. The non-renewability of the biomass in Ghana was actually higher than as estimated by the Gyapa Project. However, it was explained to him that it was important that a conservative figure was used as required by the applicable approved methodology.
2. Copies of annual reports on the performance of the Gyapa Project (Monitoring Reports) be sent to the Energy Commission of Ghana in order for the commission to include it in its energy planning activities. The suggestion was adapted and the annual reports on the Gyapa project are provided to the ECG.
3. Additional monitoring suggestions by the Environmental Protection Agency of Ghana were received and incorporated in the monitoring tools.
4. KITE-Ghana suggested that as much of the carbon benefits as possible be passed over to the stove users. They also wanted Climate Change Education and Awareness included in the stove marketing activities. They were informed that the project subsidises the stove prices and conducts marketing activities that incorporate climate change awareness creation. Retailers of Gyapas sell the Gyapas together with a warranty card which includes a message that the carbon credits associated with use of the stove are already used by EWV to support costs of stove production and promotion. The user is therefore informed that the value of the credits has effectively already been realized by virtue of the subsidized price of the stove. The distribution of this message contributes to awareness and education with respect to carbon benefits and climate change.

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

The project implementation has already been designed in such a way that all the comments are addressed positively. The opinions expressed by the stakeholders have resulted in increased motivation and work to implement key project goals such as to *(See separate document ;* **Stakeholder Consultations Report..pdf***):*

In response to the comments received, EWV-Ghana has taken the following actions:

- Stringent quality control and quality assurance measures with random but regular quality checks carried out in the market by EWV-Ghana staff.
- EWV-Ghana maintains the price of the stoves as low as possible as explained under section A.4.4 above. The marketing of the stoves has also been expanded to other regions of Ghana with the objective of reaching as many people as possible.
- The non-renewability of the biomass was reviewed and amended in order to enhance conservativeness.
- Project progress and monitoring reports are being copied to the ECG.
- The sustainable development monitoring parameters were revised in line with the comments received during the consultations.
- EWV-Ghana has prepared and conducted social marketing activities which have incorporated climate change education in line with KITE-Ghana's recommendations.

The key stakeholders have been consulted individually as part of the second round feedback and they have been updated on the actions taken in response to their feedback.

The pre-feasibility assessment matters were all addressed separately and Gold Standard Foundation was given feedback in form of a response sheet. Where matters raised were of concern to any Agency in Ghana, a visit was arranged and the matter was discussed and resolved *(See separate document;* ***Agencies Consulted in the Gyapa Project Design Cycle.pdf****).*

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not benefit from any public funding. The only other source of funding for the project during the initial set up was a grant from the Environmental Protection Agency of USA. However, this funding was limited to the first 2 years of the project and was used for project set up, some training and initial purchase of tools for the stove manufacturers.

Annex 3

BASELINE INFORMATION

The fuel savings that are obtained with the use of Gyapa cook stoves as opposed to baseline stove (traditional charcoal "coal pots") in Accra, Ghana, taking into account different family sizes and normal usage conditions such as use of LPG, kerosene, and old inefficient stoves alongside the Gyapa were determined through a KS (February 2008) and a subsequent KT (November 2008). The tests conducted to determine the fuel savings satisfied the conditions set out in the Gold Standard Cook stove Methodology.

From the KS, it was determined that the baseline was the traditional charcoal "coal pots" while the following clusters were identified as required by the methodology for varied emission reduction characteristics:

- Small Gyapa stoves for domestic application use. The conservative assumption is made that all such Gyapas are used for domestic purposes; if any achieve greater fuel savings due to commercial application such as street-vending, this is not accounted for.
- Medium domestic Gyapa stoves used for domestic applications
- Medium and large Gyapa stoves used for commercial cooking only (applications such as street-vending of cooked food)
- Medium and large Gyapa stoves used for institutional applications (applications such as cooking in school or hospital kitchens).
-

In practice the KT was conducted only on commercial users and the prospect of a KT to test fuel savings in institutional applications is reserved as a potential "New Stove KT" under the monitoring plan.

From the KT, the mean reduction in charcoal consumption with use of Gyapa as opposed to the traditional "coal pot" was found to have the following values:

- 0.25 kgs per stove per day for small domestic Gyapa stoves
- 0.51 kgs per stove per day for medium domestic Gyapa stoves
- 2.42 kgs per stove per day for medium and large commercial Gyapa stoves

Furthermore, based upon these samples, we were able to infer that with 90% confidence, the mean fuel saving of the stoves are greater that the following:

- 0.19 kgs per stove per day for small domestic Gyapa stoves
- 0.44 kgs per stove per day for medium domestic Gyapa stoves
- 1.21 kgs per stove per day for medium and large commercial Gyapa stoves

These values of fuel reduction can be applied to all sales of Gyapas.

Annex 4

MONITORING PLAN

The project will follow a Monitoring Plan as set out in the methodology "Improved Cook-stoves and Kitchen Regimes".

Of particular importance is the requirement that a survey is undertaken of 25 Gyapa stove customers each three months, and that the data collected is held in a Detailed Customer Database. This data will function as a guide to sustainable development indicators, as a guide to evolving baseline conditions and to factors such as usage drop-off and age performance of Gyapa stoves.

The Kitchen Surveys will also monitor the success of the mechanism[24] applied to encourage decreased use of inefficient stoves as secondary utensils or back-ups to the Gyapa. It will do this by counting the number of secondary inefficient stoves in samples surveyed. The mechanism will be improved or changed according to the success shown. During the initial project launch period, the mechanism consists of ensuring that Kitchen Tests measure performance net of secondary stove usage, which provides a strong incentive to the project participants to eliminate secondary stove usage. This incentive will remain in place throughout the project, but will also be augmented by further mechanisms and incentives.

The Monitoring Plan also will include biennial or more frequent KTs, which will be used to update the values used to calculate emission reductions progressively. These will also include investigation of the performance of ageing Gyapa stoves, so that such adjustments can be made to the emission reduction values used in monitoring reports. Equally usage drop-off will be investigated, and appropriate adjustments made to emissions reductions claims based on measured usage drop-off rates.

The monitoring KTs will also include KTs focussed on new stove designs, as and when such designs are introduced to the market, as envisioned by the methodology. This includes design improvements to the charcoal Gyapa, and encompasses the eventuality of introduction of efficient firewood Gyapas in rural areas, or in non-domestic applications, where firewood is the prevalent fuel. The on-going Kitchen Surveys and the "New Stove KT" also allows for the introduction of new clusters of Gyapa users. For example, the November 2008 KT did not accommodate institutional application of the charcoal Gyapas. A New Stove KT may be used to measure savings by institutional users, either of wood or of charcoal fired Gyapas.

An annual literature search will scan publicly available information on other improved cook-stove projects in Ghana to confirm that double-counting does not take place (monitoring parameter 11)..

A monitoring report will be issued each year for submission to the verifying DOE. A check will be made each year as to research on green house gas emissions from charcoal production, in order to ensure that upstream emission reductions are calculated from the most credible and up-to-date information available.

Verification will take place annually, and the Verification report will follow the methodology in the above respects. Updated assessments of sustainable development indicators will be included as a component of monitoring report submitted for Verification.

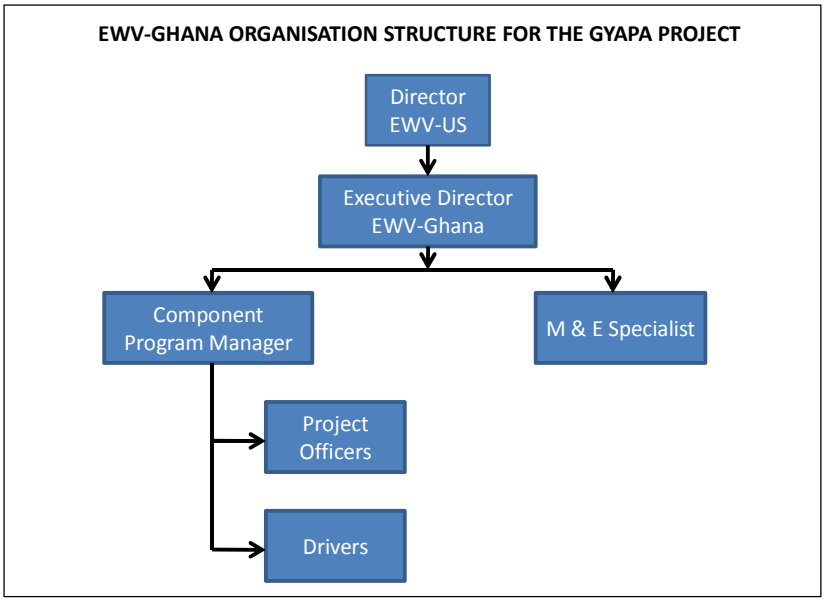
[24] EWV are developing a trial rebate mechanism which discounts the price of a new Gyapa in return for surrender of a used coal pot in operational condition

Annex 5

OPERATION AND IMPLEMENTATION

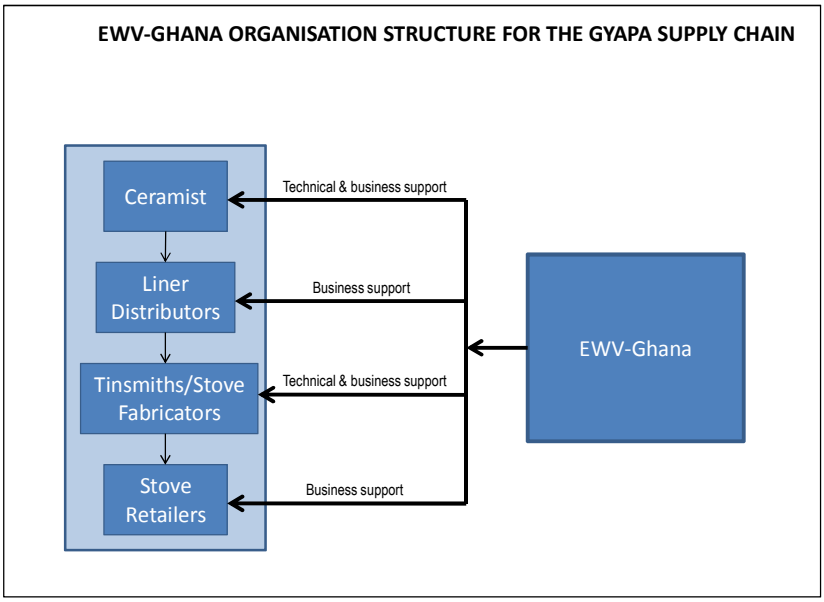
Project Operation

EnterpriseWorks/VITA-Ghana (EWV-Ghana) is the implementer of the Gyapa cook stove project in Ghana. EWV-Ghana is a branch of the EWV-US which is headed by a Director. The EWV-Ghana Executive Director reports to the EWV-US Director (See the EWV-Ghana Organisation Structure for the Gyapa Project). Under the EWV-Ghana Director, there is an E & M Specialist who is responsible project monitoring activities while the Component Project Manager, who also reports to the EWV-Ghana Executive Director, is responsible for project implementation, including records maintenance. To support the Component Project Manager, there are Project Officers, who are assigned areas of work geographically, and who support the project implementation along the value chain with visits and extension services. Drivers often make Gyapa deliveries to the distributors besides providing transport to the Project Officers.



The Gyapa supply chain (See organogram below), which is designed, developed, managed and coordinated by (EWV-Ghana), involves the following players:

- **The ceramicists** who are chosen by (EWV-Ghana) to make the liners for the Gyapa stove, a crucial part of the process given they are key to the stove's fuel efficiency. Each potter is provided with after-sales care, quality control and business advice by (EWV-Ghana).
- **The stockists**, who sell ceramic liners to the manufacturers.
- **The manufacturers** are appointed by EWV-Ghana.from who already existing metal products manufacturers, Each manufacturer produces steel stoves from scrap metal.
- **The retailers**, who are recruited by EWV-Ghana from people who are already selling the traditional coal pots before the new stoves became available.
- Customers who buy and use the Gyapa stove from the retailers.



The supply chain is further shown on the website http://www.enterpriseworks.org/pubs/May%2007%20Gyapa%20supply%20chain.pdf.

Marketing, advertising and brand management are done by EWV-Ghana who controls the labels and manages all the Gyapa advertisement and awareness creation programs

EWV-Ghana also provides support in form of resources such as training and tools to those in the supply chain. EWV-Ghana identifies, recruits and trains both the liner manufacturers and stove fabricators. EWV also facilitates the process of identifying equipment and tooling needs on an individual basis and helps to finance the acquisition of the required equipment (such as baking ovens) and tools. EWV-Ghana then facilitates the business arrangement between the liner manufacturers and the stove fabricators as they start to trade with one another. EWV-Ghana pulls out of the day to day liner sourcing arrangements while ensuring that the fabricators only source liners from EWV-Ghana trained and approved liner manufacturers. EWV-Ghana controls the liner and stove prices through regular consultative meetings involving liner and stove producers. EWV-Ghana also monitors quality of the stoves in the market and is able to trace a stove to both the liner and stove manufacturer through an internal identification system maintained by EWV-Ghana. The identification and traceability system is also used to track the Gyapa stoves in the market and to avoid double counting.

EWV-Ghana administers a warranty system, with warranty cards, which also help with the sales recording process. All the retailers are supplied with warranty cards which they are required to request the stove buyers to fill with contact details and stove size on the understanding that the liner would be repaired cheaply in case of damage. The filled warranty cards are collected by EWV-Ghana staff assigned to the area of sale. They are then entered into the Sales Record to facilitate KSs and KTs.

Distribution costs are factored in the stove cost and the stove manufacturers carry out the deliveries generally. EWV had discussions with some of the stove manufacturers to assist them with deliveries by availing a truck,

the modalities of which are being worked out. EWV-Ghana has deliberately arranged it for all the retailers to be situated close to the manufacturers to ensure quick, cheap and easy transportation along the supply line.

Any stove that has liner damage or failure has the liner replaced at a nominal cost by the manufacturers. In such cases, the damage is reported and the stove is returned to the manufacturer either through the retailer or EWV-Ghana staff (Project Officers or Drivers).

Training

General

Having identified the additional knowledge and skills required to make liners (pottery skills, formulation knowledge) and fabricate stoves (metal sheet fabrication and joinery, etc), EWV-Ghana carries out training of artisans and liner manufacturers and coordinates periodic meetings between manufacturers of stoves and clay liners.

The training covers the overall stove design, critical design parameters and fabrication skills. Characteristics of a good line and the formulation for making good liners and key considerations in determining the clay mix formulation are also taught to the artisans. The artisans are also introduced to the various types equipment (such as kilns and moulders) and tools available the production activities and the advantages and disadvantages of the options so as to help them choose the most appropriate ones for their circumstances.

EWV-Ghana also trains both the clay liner and stove manufacturers on the necessary quality control and quality assurance measures. During the periodic meetings between stove manufacturers and clay liner producers, quality, pricing and other related problems are discussed and solutions determined under EWV-Ghana facilitation.

Training Procedure

Training of Gyapa Liner and Stove Manufacturers

Manufacturer training consists of instructing and equipping manufacturers to enable them to produce stoves and stove parts of high quality at the lowest possible cost to the consumer. EWV Project staff (or Consultants) will train both ceramicists and tinsmiths. The ceramicists are responsible for the production of the stove liners and the tinsmiths manufacture the stoves.

Cash and in-kind contributions (e.g., shop space, equipment, labor, and materials) are requested from both producers (ceramicists and tinsmiths) who are benefiting from this training. Liners and stoves constructed during the training session will be given to the trainee to constitute a sort of in-kind working capital fund to help launch and sustain commercial production.

An important part of manufacturer training is the follow-up that are required after training and the launching of commercial production which will be done by EWV project staff who will be reporting to the Executive Director. This monitoring will reinforce the initial training and offer the necessary encouragement that most manufacturers of a new product line require.

Stove manufacturers

To qualify to be trained as a stove manufacturer, one would need to have prior knowledge and some skills in metal work and are already in the manufacture of similar metal products. Other key qualification for selection includes:

1. Possess a workshop with the necessary production equipment;
2. Be a producer of a variety of good quality non-welded metal items, including stoves, buckets, watering cans, student trunks etc.
3. Be dynamic with enough surplus or expansion capacity for stove manufacture.

The training regime takes two forms: formal and informal. The formal training occurs when the stoves are to be introduced to a new area and it is conducted by a technician from EWV. EWV provides templates for the various stove parts to ensure that the stoves conform to design standards. This training takes an average of 5 days and at the end of the training session, each trainee manufactures 5 stoves of acceptable standards.

With the informal method, trained manufacturers train (through apprenticeship) colleague tinsmiths in stove manufacture after they have been certified by EWV as qualified manufacturers. Depending on the artistic skill and practical knowledge of the trainee, this form takes 5 to 20 days. The trainee is then made to manufacture 5 standard stoves before he is certified by the EWV technical team comprising the program manager, technical trainer and the marketing officers.

The first 50 stoves manufactured by such newly trained manufacturers are closely monitored by the EWV technical team. Some of the standards they look out for during the monitoring are: – ceramic liner selection; cutting and assembly of the metal sheets and fixing of the liner and cement base into the metal cladding. Other than this, the EWV programme manager and his team visits all the manufacturers at their workshops at least twice a month for the first 6 months to ensure that standards are maintained. Afterwards, the monitoring visits are reduced to, at least, once a month.

Follow up visits are done to check on liners selected for stove manufacture, type and thickness of metal plate being used, strength and the finishing quality of the metal cladding and also inspect how the liner and cement base are fixed. The stove manufacturer is also advised on the right formulation (ash/sand/cement mixing ratio) of cement for the base to ensure that the stove does not damage easily during use.

Training of ceramicists to manufacture the stove liner

Almost all the liner producers are qualified ceramicists with adequate knowledge in the production of clay products. To quality to be trained, the ceramicist should also:

1. Have a well-equipped ceramics workshop marketing products primarily to non-tourist industry customers;
2. Be willing the make all necessary investments to acquire the necessary capacity for the production of quality ceramic liners; and,
3. Have access to a vehicle necessary for liner delivery

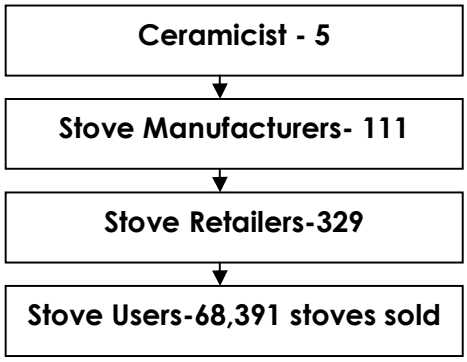
Training includes:

1. Use of the specialized equipment (e.g., moulding machine and mixer);
2. Mixing the different clay types and additives in the proper proportions, a trial and error process that is an art as well as a science and tests the ceramists' skills
3. Firing the liners to the appropriate temperature; and,
4. Properly drying the liner to prevent cracking during firing.

Steps involved in training manufacturers:

1. Identification and screening of potential manufacturers
2. Selection of a suitable venue for the training – usually at a workshop belonging to one of the trainees
3. Pre-training preparation at EWV- preparation of templates, procurement of appropriate tools, sourcing of other training materials etc
4. Actual training – that is mostly done in a hands-on manner
5. Follow-up visits to monitor progress and provide re-training when necessary.

Product Flow Chart



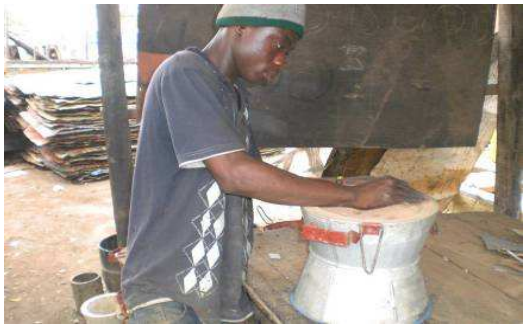
Summary of training report on Gyapa Stove manufacturers in central and western regions of Ghana, September-October 2007
Consultants

The trainings were conducted by two consultant trainers i.e. Mr. Issaka Labaran and MR. Peter Atta Amoah respectively who are were hired from Accra to handle the training sessions.

The training took place in Takoradi Township and it involved artisans from Kokompe, one of the production clusters in Takoradi.

In the fist day, the participants were taken through the production theories and opportunities and prospects of the stove business. For the remaining part of the week, the trainee artisans were given hands-on/practical training on stove making process. On completing the training exercise, each trainee was given the opportunity to produce a minimum of 50 stoves which were checked for quality conformity. Once the stoves have been produced satisfactorily, the trainees were certified to commence stove production for the project. The certification process involved the details of the trainee being entered into the EWV data as certified stove manufacture and the artisan is allowed to purchase or receive liners and also, retailers also allowed to sell his stoves to selected project stove retailers.


A training session at Kokompe


A trainee trying hands on a medium size stove

During this period, a total of 14 artisans were trained from the two region and certified to produce quality Gyapa stoves. The astisans were provided with the following logistics to enable them takeoff:

1. Standard templates for the three categories of stoves
2. A pair of shear
3. Solid metal bars for bending and forming of patterns

QA/QC Measures

As part of the QA/QC measures, EWV holds at least 1 monitoring meeting every quarter during in which matters affecting the Ceramists are discussed. Matters raised are picked up and addressed immediately. Similar meetings are held for the manufactures/fabricators and distributors but these are held regionally. The same issues are discussed as pertains to the interests of the groups.

During the quarterly meetings, pricing issues are also discussed and the prices charged by the ceramists and manufacturers are mutually agreed in consultation of both ceramists and manufacturers. Because the agreed liner prices are known to the manufacturers, they are then left to trade between themselves until a price issue is again raised by any of the stakeholders. The fabricators also sell at an agreed price to the retailers as agreed and this is monitored and checked during the routine visits to the retailers by the EWV Staff. They also verify the prices from the receipts issued to the retailers by the fabricators for the stove purchases. The retailers are not bound to sell at a price but are basically controlled by the market dynamics of demand and supply.

Monitoring

Since this project involves the progressive installation of improved stoves over several years, the baseline is considered to be evolving and is monitored alongside the project activity. The fuel savings of the stoves over time, including the aging factor, and the definitions of the clusters shall be monitored through periodic Kitchen Surveys (KSs) and Kitchen Performance Tests (KTs). The sustainable development parameters claimed by the project will also be monitored periodically.

The key monitoring tasks are continuous KS interviews, which are undertaken and recorded by EWV-Ghana staff. The results are included in quarterly monitoring reports (QMRS) submitted by EWVGhana to ClimateCare (The trading name for J.P. Morgan Ventures Energy Corporation, the legal entity). These KS interviews are supplemented by KTs monitoring utilization drop-off and fuel-saving performance, which are carried out by EWV-Ghana assisted by ClimatCare and which are reported in QMRs, as and when completed. These KS and KT tasks include investigations of non-domestic applications of Gyapas as well as domestic.

EWV-Ghana is overall responsible for maintaining the sales records and for carrying out the periodic KSs and monitoring the realisation of the sustainable development benefits, while JClimateCare will be overall responsible for carrying out the periodic KTs.

From the KSs and the KTs, the cluster definitions will be reviewed progressively, if necessary, and the clusters will be appropriately repopulated by ClimateCare in close consultation with EWV-Ghana and the KS results.

Although Carbon Monoxide and Particulate Matter levels in the kitchens will be monitored as a part of EWV-Ghana key responsibility and requirement for monitoring indoor air quality of the participating kitchens, an outside consultant with appropriate skills and equipment will be engaged for the actual measurements and analysis of the results.

Monitoring of the sales is conducted by EWV-Ghana through the sales records which are captured and reported by the retailers who also collect the warranty cards and forward them to EWV. The liner and stove manufacturers also record and report their monthly productions which are all reconciled with the sales records by EWV-Ghana (Component Program Manager). These are further reviewed by the M & E Expert as part of the ongoing monitoring and evaluation of the project performance which is required by EWV-US. At each stage appropriate reports are prepared and distributed as per the established EWV-UG and EWV-Ghana procedures.

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