

Full Monitoring Report

1 April 2012 – 31 December 2012

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Submitted by Impact Carbon with assistance from Climate Care and
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Traditional and inefficient Unimproved Sigiris



Uganda Improved Cookstoves

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1. Introduction

With respect to the Voluntary Gold Standard PDD titled:

Efficient Cooking with Ugastoves: GS Project 447

This report documents the installation of improved biomass cooking stoves in Uganda as sold by the Efficient Cooking with Ugastove's Project from 1 January 2006 through 31 December 2012. This report also documents the emissions reductions generated by these stoves between 1 April 2012 and 31 December 2012.

2. Project Description and Summary

From the start of the project in January 2006 through today, this project continues to achieve significant results in three areas:

- Business development and growth of the local stove industry at all points of the supply chain through the Uganda Improved Stove (Ugastove) brand:
 - Manufacturing
 - Recordkeeping
 - Market development
- Social, economic and environmental co-benefits to local communities
- Greenhouse gas emissions reductions.

Through carbon finance, the sale of the Project's improved cookstoves has steadily increased. In 2005, Project Partners sold less than 10 residential charcoal stoves per day. In late 2010 and early 2011, Project Partners had steadily increased to selling an average of 75-100 stoves per day. Now, in this current Monitoring Period, Project Partners sell an average of 8,105 stoves per month, or more than 330 stoves per day – this is almost a 50% increase just within the past year (last Monitoring Period was an average of 4,086 stoves per month, or 170 stoves per day). This number is expected to continue to increase over time as more manufacturing locations are increasingly supported by carbon finance, and as sales teams supported by carbon finance engage in further demand generation and awareness raising.

Stove quality remains high. Ongoing Kitchen Surveys and Usage Surveys reveal that project stoves' breakage rates are lower than assumed by the PDD, and that the liners can last longer than the metal. As high quality liners facilitate efficient combustion, having a good liner is essential in creating public trust of improved stoves. Project stoves to use improved manufacturing techniques that produce durable, strong and efficient liners, contributing to a lasting tradition of high liner and stove quality.



An EUF artisan prepares metal cladding.

Manufacturing

In this verification period, the Uganda Improved Stove brand continues to prioritize stove durability and quality. Kitchen Survey results show that the Uganda Improved Stove model is widely recognized by customers as a stove that is durable and saves charcoal; customers continue to provide positive feedback on the stove and are overwhelmingly willing to recommend the stove to others. No new stove design changes have been implemented during this monitoring period.

As the project expands, it will continue to scale the production of the current stove design as well as include new types of stove

technologies. In previous Monitoring Periods, four additional production relationships were introduced to the project and verified, and are now responsible for approximately 25% of project sales. These relationships help the project meet ever-increasing demand for improved stoves by working with additional manufacturing partners to produce high quality stove parts and high quality stoves for more people than could be reached by just one factory.

As mentioned previously, demand continues to increase every year. Even as manufacturing partners continue to scale production, factories frequently sell out everything they produce at carbon-subsidized prices; highlighting the need to not only prioritize scaling production among existing production facilities, but also to continue to identify additional partners who can provide the same high quality products. The market in Uganda is expansive; despite the Project's sales growth, there are still markets and areas that are largely unreached.

The Makindye factory reached its kiln's maximum production capacity and has used carbon revenues to invest in a second kiln on-site, which is operational as of October 2012. This kiln has the ability to double production capacity. The factory also was able to allocate some carbon revenues toward expanding storage space to hold planned increased inventory – this is very important for protecting the stoves, especially during the rainy season. Storage has become increasingly more important as Ugastove expands its retailer relationships and creates a logistics system that facilitates efficient flow of inventory and timely deliveries.



The Makindye factory's new storage space finished construction earlier in 2012.

This factory has also established three branches in Northern Uganda, with the goal of facilitating increased stove access to these more rural communities by reducing transport fuel costs and damage. These branches also provide employment opportunities and build human and institutional capacity in those communities. Located in Gulu, Arua and Lira, these branches are not yet operational for production but have trained team members who warehouse and sell cookstoves from these new locations.



A team of artisans sprays the stoves, giving them their signature colors.

The factory operated by EUF has also doubled their production capacity within the past year; next steps are to utilize carbon revenues to invest in land to build a permanent factory with more production and storage space. Other new manufacturing locations are currently producing stoves on smaller scales, and will scale production over time as carbon finance become available.

The Project has developed a quality management and assurance program to ensure all stoves meet quality standards. Carbon revenues have allowed the Project Proponents to hire additional in-country resources for the Business Development team; regular, randomized spot-checks are

performed by the Business Development team to monitor stove quality and operational efficiency. Stoves are integrated into the Project Monitoring Plan as per the project schedule to continue to monitor quality over time.

Quarterly Kitchen Surveys demonstrate that stove users report overwhelming satisfaction with stove quality, with more than 98% of customers reporting that they would recommend their Improved Stove to a friend. Usage surveys also demonstrate that stoves last for longer than projected in the PDD.

The original Ugastove factory in Makindye has been using an assembly-line structure for the past two years. New manufacturing locations will implement similar assembly-line manufacturing processes as production scales. Currently, these partners' lower production capacities make it easier to ensure overall stove quality without an assembly line. The Project Team has also trained the production managers in more efficient spot checking and quality control management, which provides an additional layer of rigor, bolstered by the Business Development team's regular randomized factory spot checks.

Record Keeping and Business Systems

Reporting and recordkeeping continues to be clear, rigorous, and comprehensive. The Makindye factory uses QuickBooks as its accounting system, which allows cross checking of electronic records with paper records and inventory and production records. Other manufacturing locations utilize a comprehensive Excel-based Tool developed by accounting experts in partnership with a small-business expert with an MBA from Presidio School of Management in San Francisco, California. This tool has been used by manufacturing partners since 2010; it allows subsidiary manufacturing locations to collect the same information as the Makindye factory, including sales, production, and labour, without having to invest in expensive QuickBooks software. This recordkeeping tool helps manufacturers be able to better understand their business operations and make informed decisions. It also facilitates robust cross checking against the sales record to verify sales. As manufacturing locations grow, they may evaluate additional software options and may potentially shift to other formats such as QuickBooks.



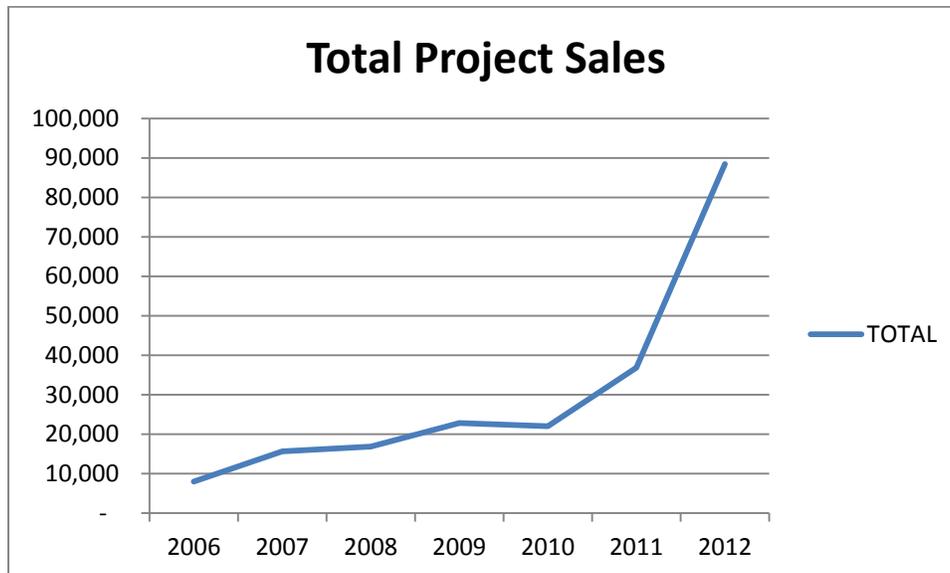
[Factory representatives attend a Traidlinks meeting.](#)

All manufacturing locations are currently working in consultation with Traidlinks, a non-profit with the goal of helping businesses in Uganda improve operations and business practices. Traidlinks has been contracted to provide additional capacity building support to all manufacturing partners in preparation for future growth. Partners learn to hone skills in areas such as recordkeeping, financial management, and human resources.

The Project continues to implement regular randomized Spot Checks to ensure recordkeeping quality and sales record conservativeness. Impact Carbon has been able to develop a Business Development team in-country in Uganda; managed by the new Country Manager, the Business Development Manager and Business Development Associate to create and regularly quality-check accounting systems that allows manufacturers to run an efficient operation and plan for future growth. Then, to add another layer of analysis to determine the conservativeness of the sales record, CIRCODU performs quarterly spot checks on recordkeeping to ensure the various components are accurate and corroborate with one another. CIRCODU's findings on the quarterly spot checks can be found appended as **Annex 11 – CIRCODU Sales Audit Report Summary**.

Market Development

As mentioned previously, Project sales have grown rapidly in the past Monitoring Period, by more than 50%:



Overall project growth in the past year is significant. In 2012, Impact Carbon hired a Country Manager and a Business Development Associate to increase the project's ability to manage partner relationships and build new supply chains. The following carbon-finance supported market development activities contributed to stove sales:

- New retailer arrangements, including new cage programs and additional retailer recruitment
- New targeted marketing initiatives such as Ramadan sales campaigns, pre-ordering options and reaching people in areas besides their homes



Ugastove's production manager Mustapha Kawenja stands next to new cages. Cages are financed by carbon revenues and allow retailers to increase product visibility while providing another advertising platform for Ugastove.

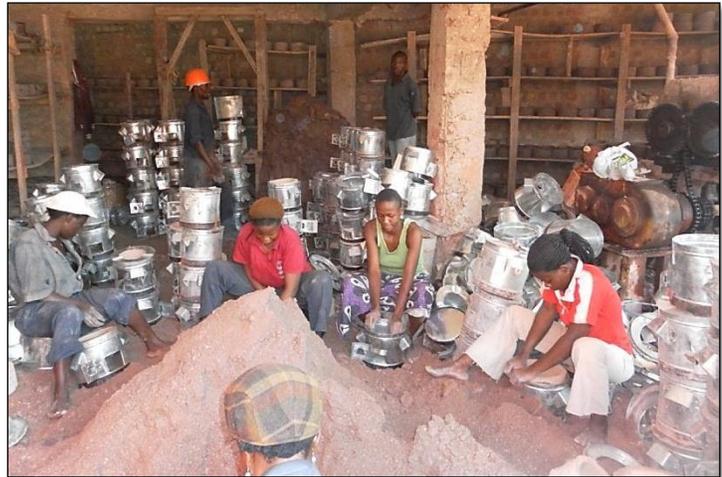
- Special subsidies and price decreases

The Project, for example, now sells 74.2% of its stoves through retail networks, and 25.8% of all stove sales direct to end-users, compared to previous years where sales were overwhelmingly to end-users. Impact Carbon has actively sought to identify additional distribution partners who would be able to help the Project reach new areas. Impact Carbon also works with its manufacturers to support distribution opportunities for small to medium-sized entrepreneurs (SMEs). This monitoring period, carbon finance supported the installation of 30 new cages for retailers. Impact Carbon has also established partnerships with new groups like UpEnergy, a for-profit organisation focused on distributing energy products such as cookstoves.

Co-Benefits

Job Creation and Capacity Building: In addition to providing direct business development and building capacity and skill sets among local employees, this project has provided many ancillary benefits in Uganda, such as supporting the local economy and creating jobs. Locally, the project continues to provide employment for significant numbers of artisans, office staff and field marketers – particularly as production relationships develop and new manufacturing locations are established. The project currently employs more than 111 artisans – this is an increase of 10 artisans from last monitoring period. Project partners also employ a total of 48 operations, management and administration staff. The project also supports more than 880 retailers and other small enterprises who sell stoves by reducing the wholesale price at which they purchase the stoves, providing a steady supply stream and putting resources into marketing the stoves to increase demand. Impact Carbon continues to work with stove manufacturers as well as retailers and distributors to create a sustainable supply chain that benefits parties at all levels of the supply chain.

Livelihood of the Poor: The project's primary goal is to reach low-income families that normally cannot afford to purchase improved stoves. This project saves customers money in two phases: first, when they purchase the stove at a reduced price, and second when they continue to save money regularly on fuel. A major way in which this has been done previously is by subsidizing the manufacture and sale of high quality, long lasting and efficient stoves with carbon revenues wherein the project applies carbon revenues to operations, sales and marketing and production efforts in order to scale the business and reduce costs. These savings are directly passed on to the end user in the form of reduced prices, facilitating greater access to these stoves than would exist without carbon finance. The Project has not only done significant self-promotion of improved cookstoves, it has also developed partnerships with organizations who distribute the cookstoves to previously inaccessible regions such as Northern and Western Uganda. These partnerships have not only facilitated awareness of the importance of improved cooking, but have also provided access to areas that previously would not have had any opportunity to buy a stove.



Ugastove's ceramics team, comprised of mostly women, prepare the stove fireboxes and add insulation.



A Ugastove user tends her matooke.

The importance of carbon finance in keeping stove costs down becomes increasingly evident as material costs rise, which would have resulted in higher stove sales. Costs related to stove production are increasing steadily; the price of raw materials can rise by as much as 50% in a year. However, despite a larger increase in costs, project manufacturing partners have been able to actually maintain or in some cases even reduce their prices on products through the use of carbon-subsidized materials. These savings are passed on to retailers and end users, who not only realize financial savings by spending less money on charcoal but can also more easily afford to purchase the improved stove.

Impact Carbon's Business Development team is creating unique distribution partnerships and marketing initiatives that will facilitate the ability to address common consumer needs (such as liquidity constraints) at scale. Partnerships with potential groups

are under development, in addition to the nascent creation of an independent sales and marketing team in-house at Impact Carbon.

Once a family owns a stove, reduced charcoal consumption (and the subsequent financial savings and other benefits for families using Ugastoves) are evident social benefits of this project as well. In Kampala, where low-income families spend as much as 15% of annual income on cooking fuels, the cost savings are immense: families using Ugastoves, which reduce fuel use by 36% compared to traditional cooking methods (refer to Table 3.4), can save more than US\$105 per year.

The reduced charcoal consumption also introduces environmental benefits through minimized charcoal-production pressure on forest resources. In a country where more than 90% of the population cooks with biomass fuels¹, scaling dissemination of high-efficiency cookstoves is a necessary part of the effort to mitigate deforestation trends.

Impact Carbon is committed to changing the household energy paradigm in Uganda from inefficient and unhealthy cookstoves to efficient, improved stoves. Achieving this shift on a national scale requires sustained marketing campaigns, stove subsidies financed by advanced carbon payments, and creating comprehensive and far-reaching partnerships between improved stove manufacturers and distribution networks.



A motorbike rides away with a sack of charcoal.



An EUF user preparing her family's meal.

Carbon finance has been critical for facilitating these important partnerships - increasing sales, reaching more people and scaling the size and impact of the project. Project partners continue to roll out new marketing and distribution programs to increase sales, using carbon revenues to further grow and develop concentrated marketing efforts, such as the events were outlined in the "Market Development" section. Furthermore, Impact Carbon's Business Development team remains an expert resource for stove manufacturers, helping them understand business trends through better recordkeeping and management systems. The Business Development team has leveraged carbon revenues to add an additional employee with extensive Monitoring & Evaluation experience to ensure that the project can provide sufficient support to all manufacturing partners. Impact Carbon also hired a Country Manager based full-time in Kampala to oversee program management in-country; the CM works with the PP team to ensure both stove manufacturers and distributors' success in addition to overseeing internal initiatives such as establishing an internal sales team and running pilot projects.

¹ http://www.who.int/indoorair/publications/indoor_air_national_burden_estimate_revised.pdf

Quarterly Kitchen Surveys reveal that the project continues to achieve the social, economic, and environmental impacts that it is intended to achieve. Kitchen Surveys also repeatedly assess the project's continued positive social impacts. Environmentally, all impacts outlined in the PDD are being achieved, as stove sales continue to reduce pressure on unsustainably harvested forests. Economically, these improved stoves continue to improve the limited incomes of impoverished Ugandan families, and to improve their health. Further detail can be found in the Kitchen Survey reports, **Annexes 02 and 03**.

3. Monitoring of parameter values

The tables below summarize the updated values of all the monitored parameters as defined in the PDD's monitoring plan. The source of each value is given in the table, and the relevant reports are in separate files appended to this document. These parameters were initially assessed in the Baseline Study and KPTs which were first performed beginning in 2006, completed in 2008 and validated upon project registration. Parameters measured every two years did not require resampling this verification, according to the applied methodology. Project baseline fuel consumption factors were updated during the 2010 KPT (see **Annex 01A**), conducted in late summer/early fall 2010; aging KPTs are conducted biennially to measure stoves' fuel savings as they age (**Annex 01B**). Usage factors are updated using the results of the recently conducted 2012 usage survey.



Ugastove's truck is just one part of a comprehensive marketing plan that increases sales. This truck not only holds inventory and transports stoves, but also markets the project's brand to consumers.

Baseline Methodology: As is listed on page 21 of the registered PDD, the project follows the methodology approved in January 2008 by the Gold Standard Foundation entitled "Improved Cook-Stoves and Kitchen Regimes", now referred to as Version 01. This methodology covers both the baseline and monitoring requirements for such a project.

Monitoring Methodology: The monitoring methodology is conducted in accordance with the baseline methodology as registered in the PDD. It is important to note that PP has, however, adopted the Version 3 approach to usage monitoring across the charcoal stove population. As this cluster adds in stove technologies from multiple factories over time, the project's original usage monitoring methodology wherein the PP randomly samples from the first year of sales does not capture new project stoves and allow these stoves to be incorporated in ongoing monitoring. PP now applies a singular usage value across the project population for the charcoal cluster, as approved by the Gold Standard Foundation.

The following tables update the status of the monitored parameters listed in Table D.2.1.1 – D.2.1.4 of the PDD:

Table 3.1 - Monitored parameters/variables#1-9

ID #	Data variable	Source of data, units	Recording frequency	Comment	Values For ER Calculator
1	Stove Sales	Sales Records	Daily	The Sales Record provides a conservative record of sales. Ugastove’s records are kept in QuickBooks and exported to Excel format, whereas other manufacturing locations/partners making the same design enter sales directly into Excel. Sales are entered using paper records and are spot-checked internally by Impact Carbon’s Business Development team and externally by CIRCODU. More information on sales records is provided in Section 5: Project Database. The sales record is used to create the Project Database, which re-organizes sales data into one spreadsheet and tracks the quantity of stoves sold each day, by cluster.	The Project Database contains daily sales information sorted by cluster. Filename: Annex 06 Complete Sales Record and Project Database.xls

2	Project Fuel Consumption	KTs	Every two years	<p>An independent third party monitoring firm, Berkeley Air Monitoring Group, conducted the 2010 monitoring KT to determine the effect of improved cooking stoves on fuel consumption in households and institutions. This KT evaluated baseline fuel consumption and project-scenario fuel savings for new stoves as well as aging stoves up to age 6 for both charcoal and institutional wood clusters. These KT results were included and verified in previous monitoring periods.</p> <p>As in the previous Monitoring Periods, the project continues to use mean fuel savings for charcoal stoves. This is because the test met the 90/30 rule. So, the fuel savings value used for calculation purposes is .068 kg per person-meal. It should be noted that using the mean fuel savings based on the 90/30 precision rule is only applied to charcoal stoves. Results from the institutional wood KPTs did not meet the specified confidence and precision to apply the 90/30 rule; therefore, fuel savings figures for institutional wood remain the same as previously submitted. The fuel-savings findings of the monitoring KT can be found in Annex 01A (Aging KT data on fuel performance over time is available in Annex 01B). The person-meal analysis was derived from the cumulative Kitchen Survey data.</p> <p>A new Aging-Stove KT was performed in 2012, per the requirements of the methodology for ongoing KT. This KT evaluated Aging-Stove fuel performance for Ugastove charcoal stoves with an average age of six years, as well as Aging-Stove fuel performance for EUF charcoal stoves with an average age of two years. The Aging-Stove fuel performance assessment for EUF charcoal stoves was conducted per GS requirements to include new project stoves from companies other than Ugastove in future KT (ref: Annex 17) by comparing stove performance for aging devices manufactured by companies other than Ugastove to aging stove performance data previously collected for existing technology in the cluster (ref: Annex 19). The KT confirms that Aging EUF stoves perform the same as the Ugastoves.</p> <p>Other factory stoves will undergo Aging-Stove KT on the same Aging schedule as Ugastoves and EUFs as they reach appropriate age; currently other factory stoves are still less than one year old and are not eligible for Aging-Stove KT; WBTs conducted in 2012 verified that these stoves perform the same as other stoves in the cluster when they are new and will be included in future KT the same way that EUF stoves have.</p>	<p>See Table 3.3. Further information on KT values available in Annex 01A and Annex 01B, GS Support of method approach in Annex 19 - Letter from Gold Standard, Aging KT</p>
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3	Clustering definitions	Monitoring KS, Biannual KTs	Quarterly (KS), Biannual (KT)	Clustering definitions remain unchanged. The Project continues to measure fuel savings on a per person-meal basis (the cooking of one meal for one person), Thus, total fuel savings are calculated by multiplying fuel savings per person meal by the number of person-meals per day of stove usage. Person meals per day are calculated from the Kitchen Survey results. With a sample size of 671 for the charcoal cluster and 45 for the institutional wood cluster, this data dates back to the first monitoring and is the most comprehensive and accurate representation available of the true project population. An assessment of the ongoing Kitchen Surveys confirms that clustering definitions should remain the same.	N/A
4	Usage factor	Usage KT or KS	Annually	<p>For the fifth issuance, the project is using the latest version of the GS Methodology (Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011) to calculate a cumulative usage rate of all household charcoal stoves within the project database/sales record, as approved by the Gold Standard Foundation. For increased accuracy, usage factors are assessed annually rather than biennially. These numbers are applied to each year.</p> <p>For Charcoal Stoves age 5-6 see Annex 04 Usage Monitoring Report, Charcoal; for Institutional Wood Stoves see Annex 05 Usage Monitoring Report, Institutional Wood. Previous usage survey data was verified, and can be found on tables 3.7 and 3.8.</p>	See table 3.7 (Charcoal Stoves) and 3.8 (Institutional Wood) below
5	Age Factor	Stove-age KT	Every two years	<p>The findings of the monitoring KPTs as reported in Annex 01A were that Baseline and Project Fuel consumption values remain the same for the full set of stove vintages for charcoal stoves. Stoves from the original 2006 cohort were re-monitored using a standard KPT, which suggested an insignificant change in fuel use.</p> <p>Project Fuel savings for institutional wood stoves starting with Age 4 is 94% of fuel savings seen in stoves during the first 4 years of lifespan. Fuel savings are adjusted by a conservative factor of .94 for institutional stoves starting Age 4 (see Annex 01A). The next Aging-Stove KT performed in 2012 for institutional wood clusters indicates that for Aging Ugastoves Age 6+, fuel savings is slightly less as in the previous Aging KT (Age 4). An adjustment factor of .90 is applied for institutional stoves starting Age 6 (see Annex 01B).</p> <p>The next Aging-Stove KT performed in 2012 for charcoal and institutional wood clusters indicates that for Aging Ugastoves Age 6, fuel savings is the same as in the previous Aging KT (Age 4). Therefore, for charcoal stoves there is no decrease in fuel performance.</p>	See fuel consumption factor in Table 3.5 , reference Institutional Wood ER Calculations.

6	New Stove performance	Additional Stove Kitchen Tests for additional stove clusters	When a new cluster is added, or every two years	<p>The findings of the monitoring KPTs are reported in Annex 01A for new stove performance. The Project uses Berkeley Air's recommended person-meal metric to more accurately measure fuel use and fuel savings. Data on number of person-meals cooked is derived from the Kitchen Survey.</p> <p>No new clusters have been added and therefore no new KT's are required. Ongoing Kitchen Surveys indicate that the customer population has not changed from the baseline and therefore no new baseline KT's are necessary.</p>	See Table 3.5 , Emission Reduction Values
7	Market development	Company records and Marketing Reports	Quarterly	Over the past year of the crediting period, monthly sales continue to grow. Specific numbers can be found in the Project Database. The Project is also working to develop new markets both around Kampala and in rural areas upcountry. Various marketing materials can be found in Annex 12 .	N/A
8	Non-Renewable Biomass fraction	FAO; 2010 Global Forests Assessment Data	Every two years	<p>NRB values were updated according to CDM methodology AMS-II. G., using the WISDOM approach and values from FRA2010 Global Tables.² This data shows that the growing stock in Uganda is 155,300,000 m³. A generic growth rate of 2.5%³ is applied to the growing stock, resulting in a mean annual increment (MAI) of 3,882,500 m³/y:</p> $MAI = 155,300,000 \text{ m}^3/\text{y} * .025 = 3,882,500 \text{ m}^3/\text{y}$ <p>DRB is calculated as follows:</p> $D = RI - \frac{B}{R} \times A$ <p>The suggested value for industrial and woodfuel removals (R) in Uganda is equal to 45,961,362. The portion of accessible area (A) is determined by subtracting the proportion of protected area of 24%⁴ from the total forest area to get a value of 76%. According UNData, B is 33,604,000.⁵ Thus, DRB= 2,157,363 m³.</p> <p>NRB is calculated by subtracting DRB from B_y:</p> $NRB = 33,604,000 \text{ m}^3 - 2,157,363 \text{ m}^3 = 31,446,637.41 \text{ m}^3$ <p>The fraction of non-renewable biomass is calculated as follows:</p> $fNRB = \frac{NRB}{NRB + DRB}$ <p>Thus, the current value for NRB is: 0.936</p> <p>The NRB value of 0.936 was also validated for GS1044, UpEnergy's Uganda Biomass Cookstove Project (see PDD Annex 3) using the same approach.</p>	0.936

² Source suggested by SSC WG33 Annex 8, pg. 51, available at http://cdm.unfccc.int/Panels/ssc_wg/meetings/033/ssc_033_an08.pdf.

³ Default rate for Africa suggested by SSC WG33 Annex 8, pg. 51.

9	Baseline Fuel Consumption	Baseline and Monitoring KT	Baseline KT was performed in 2010; as baseline population has not changed there is no need to reassess baseline fuel consumption	Berkeley Air Monitoring Group was contracted to perform the 2010 Kitchen Test to re-evaluate baseline fuel consumption and measure fuel savings on all new and aging stoves. The survey was conducted using a larger sample size and had a tighter confidence interval than the previous monitoring KTs. Upon performing more robust monitoring to increase accuracy and precision, the findings of the monitoring KPTs as reported in Annex 01A were that Baseline and Project Fuel consumption values are updated for the full set of stove vintages. The baselines can be found in the report, and have been included in prior monitoring periods since 2010.	See Tables 3.2, 3.3, 3.4 below
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Carbon Calculator Inputs:

Charcoal Stoves: Based on the most recent KPT data, the estimated fuel savings per stove year is assessed to be the same for stoves Age 4-6 as it is for stoves of Age 0-4 (see **Annex 01B**). The 2010 KTs findings determined that there was no significant difference in fuel savings among household stoves as they age for the first 4 years; the 2012 KTs determined that there is no significant difference in fuel savings among households as they age for the first 6 years (in fact, KTs show that fuel savings slightly increase for the age 4-6 bracket, but for conservativeness PP assumes fuel savings is the same). While household stove usage drops off over time (Tables 3.3 and 3.4 below), fuel savings per stove still in use, per stove year, remains constant over the first 6 years of a stove lifespan. The data from this report can be found in **Annex 01A**. This data is consistent with past assessments of fuel performance which also found that household stoves did not see a change in performance over the first 3 years of a stove lifespan.

The Kitchen Surveys show that the estimation of constant stove performance is particularly conservative because Uganda Improved Stove customers were using less fossil fuels, and using other stoves much less often than prior to purchasing their Uganda Improved Stoves. At the same time, Kitchen Survey observations reveal that as the stoves age, the pot holders recess and the pots drop closer to the charcoal, increasing thermal efficiency.

The KPT, which calculated fuel savings per person-meal, found estimated fuel savings were not significantly different per person-meal based on stove size or type of stove use (ie: purely domestic or business households). However, the number of estimated person-meals cooked varies greatly, based on type of stove use. Because business households cook significantly more person-meals per day on their stoves, those customers see significantly greater fuel savings over the course of a year.

As shown in Table 3.3 below, the mean fuel savings value found during the 2010 KPT conservatively estimates the fuel savings to be .068 kg per person-meal for each stove, and that the variance in person-meal fuel savings based on stove size was insignificant. The average number of person-meals a stove cooked per day varied, depending on whether the stove was used commercially, or for business-household use. Emission Reductions values adjust for this variance in person-meals. For conservativeness, all data is taken from the dry season, because Kitchen Survey data reveals that households cooked slightly more person-meals during the rainy season. The Kitchen Survey

⁴ FAO Forest Resource Assessment 2010 Uganda, pgs. 9 and 16.

⁵ UNData, Fuelwood consumption by households. Available at <http://data.un.org/Data.aspx?d=EDATA&f=cmlID%3aFW%3bcrID%3a800%3btrID%3a1231&c=2,5,6,7,8&s= crEngNameOrderBy: asc, enID:asc, yr:desc&v=1>. Source suggested by SSC WG33 Annex 8, pg. 51

shows that households using the stove for purely domestic purposes cooked 16.39 person-meals per day, while households using the stove for commercial purposes in addition to domestic (referred to as business-households) cooked 41.25 person-meals per day. The cumulative Kitchen Survey data also reveals that 8.79% of households cook commercially. By using a weighted average which factors in for the 91.21% of charcoal stove owners cooking domestically, it can be found that charcoal stoves size 1-5 cook an average of 18.58 meals per day.

Institutional Wood: Berkeley Air’s findings also determined that while institutional stove fuel performance stays constant for the first 4 years of stove use, performance begins to decline for stoves after Age 4; for all Aging stoves monitored after Age 4 the performance stays constant at that new level until Age 6, when there is another dropoff in performance. The data from this report can be found in **Annex 01A**; Aging KT data from 2012 can be found in **Annex 01B**. Due to the changing performance of institutional stoves, the cluster adjusts by .94 for aging performance of stoves starting with Age 4, and .90 for aging performance of stoves starting with Age 6.

It was previously verified that the lower 90% confidence interval for institutional stoves is .072 kilograms per person-meal for all Institutional Stoves. The average number of person-meals a stove cooked per year varied, depending on the type of institution at which the stove was used. If a stove was used in a school versus a non-school, for example, it was conservatively assumed that schools only cook for 270 days per year, while non-school institutions are conservatively assumed to cook for 335 days per year. Furthermore, if a stove was used in a primary school, it was conservatively assumed that the number of person meals per day was half that of a secondary school or non-school institution, as primary school students may be expected to eat less. Person-meal data was collected from the Institutional Kitchen Survey.

The tables below further explain person-meal and fuel savings calculations:

Table 3.2 Cooking Frequency and Meals Served per Stove							
Cluster	Cooking Type	Percent of Population	Daily Individual Meals Served		Cooking Frequency	Total Annual Cooking	
			person-meals/stove-day	person-meals/stove-day		person-meals/stove-year	person-meals/stove-year
		%	Mean	Weighted	days/year	Mean	Weighted
Charcoal Stoves	Domestic	91.21%	16.39	18.58	365	6,781	6,781
	Commercial	8.79%	41.25				
Institutional Wood	Primary School	35.2%	493		270	132,975	
	Secondary School	21.4%	1,443	N/A	270	389,693	752,558
	Non School	43.4%	4,277		335	1,432,679	

Explanation of Key Parameters:

Percent of Population: The percentage of stoves that are represented by a certain category within a cluster. For example, of all of the institutional stoves in the institutional wood cluster, primary school institutions represent 35.2%. Of all the charcoal stoves in the charcoal stove cluster, commercial business-households represent 8.79%. As clusters are defined by fuel savings per person meal, categories within clusters are only for the purpose of accurately weighting person-meal calculations.

Person-Meals/Stove Day: The average number of person-meals that are cooked by each category within a cluster per day. For charcoal stoves, person-meal data is derived from the Kitchen Survey, per Berkeley Air Monitoring Group’s recommendations. For institutional wood stoves, person-meal data assumes a standard conservative 2.5 person meals/stove day. For conservativeness, primary school institutions receive an additional adjustment factor of .5 to account for the fact that primary school students eat less. *Note: For charcoal stoves, a weighted person meals/stove day figure is applied to factor in for the 91.21% of stoves that cook purely domestically while 8.79%

cook commercially. A weighted value is not derived institutional stoves until the number of days/stove year have been factored in also.

Days/Stove Year: The number of days per year a stove cooks meals. While household charcoal stoves are used 365 days per year, it is assumed that school institutions cook 270 days per year and non-school institutions cook 335 days per year.

Person-Meals/Stove Year: The number of Person-Meals/Stove Day multiplied by the number of Days/Stove Year

Table 3.3						
Fuel Consumption and Savings						
Cluster	Cooking Type	Baseline Fuel Consumption	Project Fuel Consumption	Fuel Savings		
		kg/person-meal	kg/person-meal	kg/person-meal		
		Mean	Mean	Mean	Weighted	Adjusted
Charcoal Stoves	Domestic	0.193	0.121	0.069	0.068	N/A
	Commercial	0.245	0.190	0.063		
Institutional Wood	All	0.199	0.102	0.097	N/A	0.072

Explanation of Key Parameters:

Baseline Fuel Consumption: This is the kilogram/person-meal figure for baseline fuel use. Baseline fuel consumption values for institutional stoves were verified in 2009, available upon request as “Baseline KPT Report” and can be referenced in past verification materials. Baseline fuel consumptions values for charcoal stoves come from the 2010 KPT performed by Berkeley Air Monitoring Group (see **Annex 01A**) and were verified previously also.

Project Fuel Consumption: This is the kilogram/person-meal figure for project fuel use. New stove values for charcoal stoves come from the 2010 KPT; aging charcoal stove values through Age 4 were measured in the 2010 KPT (**Annex 01A**); aging charcoal stove values after Age 6 come from the 2012 KPT (**Annex 01B**) . Aging stove values for institutional stoves for Ages 4-6 come from the 2010 KPT, while Ages 6+ come from the 2012 KPT.

Fuel Savings: For charcoal stoves, this is the mean fuel savings value for fuel savings/person meal, as was discussed in the above clustering definitions. This is per a Gold Standard recommendation in the 2nd Monitoring Period, stating that the Project Proponent may update the emission reduction calculations using the mean fuel savings approach if the required 90/30 precision rule is met. The table for how the 90/30 precision rule is met is provided below, as Table 3.6a. Values for charcoal stoves come from the 2010 KPT performed by Berkeley Air.

It should also be noted that using the mean fuel savings based on the 90/30 precision rule is only applied to charcoal stoves. Results from the institutional wood KPTs did not meet the specified confidence and precision to apply the 90/30 rule; therefore, fuel savings figures for institutional wood remain at the Lower Bound of 90% Confidence Interval for Fuel Savings/Person Meal.

Table 3.4 Emission Factors (EF) and Non Renewable Biomass (NRB)					
Cluster	Year	CO2 EF	CH4 & N2O EF	NRB	EF nrb
		tCO2/t_fuel	tCO2e/t_fuel	percentage	tCO2e/t_fuel
Charcoal Stoves	2006-2008	5.106	1.238	91.00%	5.884
	2009-2010	5.106	1.238	90.40%	5.854
	2010 - 2012	5.106	1.238	91.58%	5.914
	2012-2	5.106	1.238	93.60%	6.017
Institutional Wood	2006-2008	1.747	0.455	91.00%	2.045
	2009-2010	1.747	0.455	90.40%	2.035
	2010 - 2012	1.747	0.455	91.58%	2.055
	2012-2	1.747	0.455	93.60%	2.090

Thus, the following values for CO2e savings per stove year are entered into the ER Calculator:

Table 3.5 Emission Reductions Values						
Cluster	Stove Age	Total Annual	Fuel Savings	EF nrb	Age Adjustment	Emissions
		meals/stove-year	meal	tCO2e/t_fuel	percentage	tCO2e/stove-year
		Weighted	Mean			
Charcoal Stoves	0-6	6,781	0.068	6.017	100%	2.77
		90% CI Adjusted		90% CI Adjusted		
Institutional Wood	0-4	752,558	0.072	2.090	100%	113.26
	4-6	752,558	0.072	2.090	94%	106.46
	6+	752,558	0.072	2.090	90%	101.93

Equation to Calculate ER Value:

$$\frac{(\text{Person-meals/Stove-Year}) \times (\text{Fuel Savings kg/person-meal}) \times \text{EF}_{\text{nrb}} \times \text{Age Adjustment (if any)}}{1000}$$

Table 3.5a Applying 90/30 precision rule to Charcoal KPT	
"Stove Effect" Fuel Savings (kg/person-meal)^	
n	112
mean	0.068
stdev^^	0.095
std error	0.009
^See KPT Report, Table 5, pg. 19 (Q209 - Q210 Annex 01 KPT Berkeley Air 2010 Phases 1-5)	
^^std error = stdev/(sqrt(n))	
90/30 Rule Check	
1.66*[stdev/sqrt(n)]	0.015
0.30*mean	0.020
Meets 90/30 Rule^^^:	Yes
^^^90/30 rule is met if (1.66*[stdev/sqrt(n)]) < (0.30*mean)	

Explanation of Key Parameters:

Age Adjustment: This is the value determined by the aging institutional KPTs. Berkeley Air determined in 2010 that institutional wood stoves starting Age 4 exhibit 94% of the fuel savings that younger stoves do. The 2012 KPT determined that institutional wood stoves starting Age 6+ exhibit 90% of the fuel savings that younger stoves do. No age adjustment is applied to charcoal stoves.

Emissions Reduction: This is the Emission Reduction Value that is entered into the calculator. This is achieved by multiplying the average number of person-meals per stove year by the mean fuel savings value for fuel savings/person meal (or lower 90% confidence interval value for institutional stoves), which is then multiplied by the EF NRB. This value is divided by 1000 to convert from kilograms to tonnes of ERs per stove, per year.

Usage: Stove usage declines over time, as detailed in the Usage Monitoring Reports (Charcoal and Institutional Wood). For added conservativeness and accuracy, usage is monitored on an annual basis. This years’ usage survey was done using the Version 3 methodology approach, wherein project stoves of every age are surveyed to establish a singular usage rate that can be applied across the project stove population. Further details on this approach and the corresponding data can be found in the document titled **Annex 04**. Usage data is available as **Annex 18**. Based on those reports, the following stove usage numbers are entered into the calculator:

Table 3.6 Cumulative Usage Drop-Off Charcoal Stoves

Cumulative Usage Drop-Off				
Usage Drop-off, Cumulative	$U_{pj,4thyr}$	0.8694	fractional	2012 Usage Survey, Project-Specific

Table 3.7 Cumulative Usage Drop-Off: Institutional Wood

Parameter	Value	Units	Source
Usage Drop-off, Age 0-1	0.10	fractional	Usage Monitoring Report: Institutional Wood Submitted and Verified in 2009
Usage Drop-off, Age 1-2	0.10	fractional	Usage Monitoring Report: Institutional Wood Submitted and Verified in 2009
Usage Drop-off, Age 2-3	0.10	fractional	Usage Monitoring Report: Institutional Wood Submitted and Verified in 2009
Usage Drop-off, Age 3-4	0.14	fractional	Usage Monitoring Report: Institutional Wood 2010
Usage Drop-off, Age 4-5	0.24	fractional	Usage Monitoring Report; Institutional Wood 2012
Usage Drop-off, Age 5-6	0.59	Fractional	Annex 05 - Usage Monitoring Report, Institutional Wood
Usage Drop-off, Age 6-7	0.20	Fractional	Annex 05 - Usage Monitoring Report, Institutional Wood

PDD section D.2.3.1. Data and information that will be collected in order to monitor leakage effects of the project activity:

Table 3.8

ID number <i>(Please use numbers to ease cross-referencing to table D.3)</i>	Data variable	Source of data, units	Comment
<i>All leakage risks</i>		<i>KS, Fuel use records</i>	<p>The Kitchen Survey found that the only source of potential leakage was fuel switching from wood to charcoal with the purchase of a Ugastove. Following analysis of surveys conducted throughout the monitoring period, no significant fuel switching was observed. Several factors in fact suggest increased fuel savings compared to the baseline, although these adjustments are not included in order to ensure conservativeness. Each new set of Kitchen Survey data is analyzed to determine if fuel switching is taking place. See Annexes 02 and 03 Kitchen Survey (KS) Reports for analysis of leakage risks to due fuel switching.</p> <p>The other main leakage risk is extra fuel use due diesel and/or petroleum-operated production machinery such as an extruder which mixes the clay, and spraying machine which paints the stoves. As a result, manufacturers have established a system that tracks all fuel purchased and used for the extruder and spraying machine through logbooks and receipts. An electronic record of all fuel purchased and used for the extruder can be found in the calculator: Summary ERs. For conservativeness, it is assumed that all fuel purchased for the machines is used; total fuel purchased for is used to calculate the CO2 equivalent of fuel used, which is subtracted from the overall Emission Reductions total in the calculator.</p>

4. Emission Reductions Calculations

Table 4.1 below shows the CO₂e emissions reductions achieved by the Efficient Cooking with Ugastoves project in the period reported from April 1 2012 through 31 December 2012. The sales and installations of these stoves took place during the period 1 January 2006 through 31 December 2012.

Table 4.1: Emission Reductions Calculations

Verification Period: 1 April 2012 - 31 December 2012							
Total Emission Reductions (tCO₂e):							319,006
Year	Cluster: Quarter	Charcoal Stoves		Institutional Wood Stoves		Leakage tCO ₂ e	Total Emission Reductions tCO ₂ e
		Stove Years	tCO ₂ e	Stove Years	tCO ₂ e		
2012	Q2	31,364	87,023	45	5,006	1	92,028
	Q3	35,341	98,058	54	5,979	2	104,035
	Q4	42,152	116,955	54	5,990	2	122,943
Total		108,858	302,036	152	16,974	5	319,006
Total ERs Before Leakage							319,011

Total Vintage 2012:	319,006
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Explanation of Emission Reduction Calculations

The Emissions Reduction (ER) Calculator calculates total emissions reductions on a quarterly basis for each stove in the Project Database. The ER Calculator is run separately for each cluster of stoves defined for the project. These calculator files accompany this report and contain the calculations of emissions reductions for each cluster:

- Charcoal Stoves
- Institutional Wood

The calculator accounts for the day that each stove begins use and calculates all the days of usage of each stove in each quarter. It factors in the monitored annual drop-off in usage as stoves age, and other monitored parameters⁶. Stove usage is calculated in stove-years which is defined as the number of stove days the stove was used divided by 365 (days). Quarterly usage per cluster⁷ (in stove-years) is multiplied by the emissions reduction per stove-year (tCO₂e/stove-year) calculated in the PDD to quantify total ERs per project quarter.

The 'Parameters' worksheet of each ER Calculation workbook states the 'Stove Days in Inventory', 'Usage Rates', and 'Emission Reductions' (tCO₂e/stove-year). Ugastove sales are listed in the 'Project Database' worksheet. The 'Stove Days in Inventory' parameter is applied to Ugastove sales (many of which are to retailers, not to end users) to ensure that the Usage Start-Date in the 'Usage Record' worksheet conservatively assesses the date on which end-users start cooking with the improved devices. The usage record is created by creating a weighted average of retail sales (in which stoves sit in inventory after a Ugastove sale) and direct sales in which stoves go into use immediately.

⁶ The full set of parameters is given in the monitoring tables. The parameter values which have changed from values given in the PDD are: the utilization factor, which now includes usage rates from stoves in their 6th year of use, and Emission Reductions values for stoves. These values are used in calculations that determine the number of stove days.

⁷ Excel Workbooks: 1April12 – 31Dec12 Charcoal Calcs.xls, 1April12 – 31Dec12 Institutional Wood Calcs.xls

Stove quantities and 'Usage Start-Dates' are linked from the 'Usage Record' worksheet to the 'Age 0-1', 'Age 1-2', 'Age 2-3', 'Age 3-4', and 'Age 4-5' worksheets. These four 'Use' worksheets calculate usage on a daily basis for each day of the project period (x-axis) for each 'Usage Start-Date' and the corresponding stove quantity (y-axis). The four 'Use' worksheets are separate to account for stove usage at different ages. Usage for all stoves aged 0 - 1 year, which are in their 1st year of use, is accounted in the 'Age 0-1' worksheet, usage for all stoves aged 1 – 2 years, which are in their 2nd year of use, is accounted in the 'Age1-2' worksheet, etc.

Daily stove use (stove-days) is calculated using Annual Usage Rates for stoves of different ages (age_{i_j}). The Annual Usage Rates are calculated to reflect annual usage drop-off from the Cumulative Usage Rates (CumUi) determined in the monitoring studies below. The Annual Usage Rate (age_{i_j}) is the average annual drop-off in usage. That rate is applied to all stoves equally over the full year they are of a given age (Age 0-1, Age 1-2, etc.).

For charcoal stoves, usage survey data acquired using the Version 3 approach, sampling from each year to ensure that new project technologies are included in the monitoring. Usage data was compiled and analyzed by age to determine the usage rate for each stove age group credited. To determine a cumulative usage rate, the drop-off rates are then weighted to be representative of the quantity of household stoves of each age being credited in the project scenario (i.e. weighted based on the total sales population by age). Based on both the usage survey and sales data, the single usage parameter, weighted by drop off rates and technology sales by age, is calculated using the following equation:

$$=(Usage_{age0-1} * Sales\%_{age0-1}) + (Usage_{age1-2} * Sales\%_{age1-2}) + (Usage_{age2-3} * Sales\%_{age2-3}) + (Usage_{age3-4} * Sales\%_{age3-4}) + (Usage_{age4-5} * Sales\%_{age4-5}) + (Usage_{age5-6} * Sales\%_{age5-6}) + (Usage_{age6-7} * Sales\%_{age6-7})$$

For institutional stoves, Calculating Annual Usage Rates (age_{i_j}) from Cumulative Usage Rates (CumUi) is uses the Version 1 approach: If 100 of 100 monitored stoves are still in use after one year, the Cumulative Usage Rate (CumU1) after one year is 100%. If 50 of the original 100 stoves are still in use after two years, the Cumulative Usage Rate (CumU2) after two years is 50%. The Annual Usage Rate (age0_1) in year 1 is 100%. The Annual Usage Rate (age1_2) in year 2 is 75% ((100%+50%)/2). Once daily stove usage (stove-days) is accounted in the 'Use' worksheets for stoves from each 'Usage Start-Date', it is converted to stove-years by dividing stove-days by 365. Stove-years of usage are aggregated on a quarterly basis in the 'ER Calculations' worksheet.

Once daily stove usage (stove-days) is accounted in the 'Use' worksheets for stoves from each 'Usage Start-Date', it is converted to stove-years by dividing stove-days by 365. Stove-years of usage are aggregated on a quarterly basis in the 'ER Calculations' worksheet.

Finally, on the 'ER Calculations' worksheet, aggregate quarterly stove use (stove-years) is multiplied by ERs per stove-year (tCO2e/stove-year) to calculate total ERs on a quarterly basis. These values from the 'ER Calculations' workbook of each cluster are linked to the 'Summary ER Calculations' workbook where ERs from all clusters are combined and the verification period is specified for crediting.

5. Project Database: Quality Assurance

With respect to Section D.3 of the PDD, careful attention has been paid to the accuracy of the sales record. As explained in this section, the Project Database is a conservative record of all stoves that have entered use, and a conservative estimation of the first day they entered use. The data in the Project Database is referred to as Data Variable: Stove Sales (ID#: 1) in the Project Design Document: Efficient Cooking with Ugastoves. The project database is used to measure Variable #1:

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?	Comment
1	<i>Stove Sales</i>	<i>Sales Records</i>	<i>Number of stoves by type and size</i>	<i>M</i>	<i>Daily</i>	<i>All sales</i>	<i>Electronic and paper</i>	

In 2006, a system was set up to track stoves entering use that would underreport sales in the face of irregularities, and thus provide a conservative record of stove usage. First, is the manufacturers are incentivized to ensure the veracity, accuracy and even conservativeness of the sales record. Each manufacturing location is subject to rigorous quarterly random sales record checks in which CIRCODU randomly selects a sample of electronic sales records and follows up to ensure there is a corresponding paper receipt. CIRCODU also contacts a random subset of customers to confirm the sale. If the random 3rd party spot checks are without error, the factory is eligible to receive an additional advance in carbon revenues to invest in social marketing and other business development.

Furthermore, conservativeness is built into the local context at the factory: in the Ugandan context, “shrinkage” (unauthorized distribution and selling of stoves off-book for personal profit) is difficult to avoid, and it is generally accepted that sales agents sometimes engage in this activity, either taking extra stoves and selling them outside the factory or intentionally underreporting sales to pocket additional income. Even though the stoves in question ultimately go into use, the current system does not count stoves that go missing from the Factories to further ensure conservativeness.

Method of Collection:

A comprehensive Project Database is kept electronically by Impact Carbon: this is **Annex 06 Complete Sales Record and Project Database**. The database logs how many stoves of each type (sorted by cluster) entered use on each day. Impact Carbon maintains this file as a password protected excel document.

The Project Database is created from the Partners’ Sales Records. The Makindye Factory’s Sales Record logs sales in QuickBooks, whereas the other Project Factories use the aforementioned Excel-based tool. The files are password-protected and can only be accessed by the Director of Finance. On a monthly basis, the sales records are quality-checked internally for accuracy to catch any data entry errors. Partners then submit the electronic sales record at the end of each month, so these records can be checked against the sales totals that are submitted at the end of each quarter. Then the sales record is checked by Impact Carbon’s Business Development Manager to prepare for the 3rd party check and ensure no overreporting has occurred. Finally the sales record is checked by a third party, the Centre for Integrated Research and Community Development, Uganda (CIRCODU). CIRCODU regularly audits sales entries and contacts customers to confirm that sales records are conservative, as expressed in their spot check reports **Annex 11 CIRCODU Sales Audit Report Summary**. Manufacturing Partners’ spot check results continue to improve as the company’s trend toward rigorous recordkeeping and build capacity.

All paper invoices and receipts are saved to provide an additional cross-check. Partners provide a paper record of every stove sold, and any sale without a paper record is removed from the database. Many stoves that enter use

are not counted, as receipts are lost, or sometimes not issued. This further ensures the conservativeness of the project database.

Project Database Electronic Record History:

As mentioned previously, the Makindye Factory consolidated all of its records into Excel starting in 2007, and now uses QuickBooks exclusively as its only electronic sales record. All sales can thus be exported into Excel files. All other manufacturing partners use an Excel-based tool, which is kept as a password protected file and submitted and reviewed on a monthly basis. This tool was verified in the previous Monitoring Period and has been adopted by additional manufacturing partners in this period.

All data has been aggregated by cluster and merged into one spreadsheet, with each tab containing the complete sales record for each cluster. Only sales made during this Monitoring Period are added to the database; previous Monitoring Periods’ sales remain unchanged.

Quarters	Sales Period Combined Sales Period	Source of Sales Records	Reference File
1 April 2012 – 31 December 2012	1 January 2006 – 31 December 2012	Aggregated sources from above	Complete Sales Record and Project Database

All the source files of sales data that are listed above have been combined into the supplementary excel monitoring report file: **Annex 06 Complete Sales Record and Project Database**. This file contains details on every stove sale made by Partners since 1 January, 2006. The information in the sales files is aggregated and uniformly formatted by cluster and date in order to create the Project Database.

Some customers buy household stoves directly from the factory and some buy from retailers. All institutional stove sales have been direct sales. According to a detailed analysis surveying a sample of Project retailers, corroborated with anecdotal reports from retailers, the average stove that is sold to a retailer conservatively spent 5.34 days in inventory before being sold to a customer, while stoves sold directly to end users go into use immediately. Sales channel, purchase location, quantity, and date of purchase details are kept for each sale in the Sales Record.

The inventory study randomly selected retailers from the complete list of retailers. Retailer details are available in the sheet **Annex 10 Partner Retailer List**. From the random sample, an analysis of order patterns was done to determine how long it takes for retailers to refill their orders, and how long an average stove sits in inventory for before it is sold. While several retailers ended up in the sample with unusually irregular ordering history and functioned as outliers, for conservativeness, those retailers were included. The survey found an average of 5.34 days in inventory for stoves sold to retailers. Of all stoves sold, 74.2% percent are sold to retailers, seeing a 5.34-day lag, while 25.8% are sold directly to end users and begin use immediately after sales. Therefore, a 3.72-day weighted lag is applied to all stoves, including those that are sold directly. Further details of the methodology to analyze time in inventory can be found in **Annex 15 - Days in Inventory Analysis Writeup**; the spreadsheet itself is available as **Annex 16 – Days in Inventory Calculation Spreadsheet**.

For institutional stoves the following additional records are kept for each sale: location and contact information, date stove build was completed, number of burners for fixed stoves or quantity for portable stoves, average number of meals cooked per day, number of people for whom food is prepared, and whether those people are children or adults. A conservative 90% usage factor is applied in each of the first 3 years, which was verified in 2009, though a Usage Survey in 2008 indicated a 100% usage factor for stoves of Age 0-1 years. Therefore, the Usage Factor for Institutional Stoves Age 0-1, Age 1-2 and Age 2-3 of 90% were verified in 2009 and remain the same. A Usage Survey performed by CIRCODU indicated an 86% usage rate in Institutional Stoves Age 3-4, 76% usage rate among Age 4-5, and 70% rate among Age 5-6 and Age 6-7. The Usage Survey report can be found in **Annex 05 Usage Monitoring Report, Institutional Wood**.

6. The Detailed Customer Database

The Detailed Customer Database is maintained by Impact Carbon to capture records of Kitchen Survey interviews.

Project Database Information

Along with sales channel, purchase location, quantity, and the date of purchase details which are kept for each sale in the Complete Sales Record, further contact details are compiled for a subset of household stove customers in a Customer Sampling Record. The Customer Sampling Record is used for customer follow-up and sampling for monitoring surveys. The Customer Sampling Record is a paper file of returned warranty cards kept in the Ugastove office. The cards are included when a Ugastove is sold. As with all warranty cards, a percentage of cards are returned to the manufacturers' offices and filed. For direct sales to end-users, manufacturers collect cards directly.

The customer sampling record continues to grow due to prioritized customer tracking. The Makindye Factory has added more than 5800 new customers to the customer sampling record in this Monitoring Period alone. The Customer Sampling Record for new stoves credited added to this verification period contains more than 12,700 charcoal stove customers and 12 institutional stove customers. These customers are distributed all throughout Kampala and neighbouring sales areas and are sufficient for random sample selections for future monitoring activities.

To reduce the possibility of sampling bias for Kitchen Surveys (people who return the warranty cards may have different characteristics from those who do not) Impact Carbon supplements the warranty cards with door-to-door surveys and telephone identification to identify additional customers. A sample of warranty card customers, and stove owners identified by the door-to-door survey, are given an in-depth Kitchen Survey. The results of this survey form the Detailed Customer Database (**Annex 07**) which provides data for **Annexes 02 and 03**. The Detailed Customer Database holds the contact information of these customers, and the specific data collected by the Kitchen Survey. This data includes information such as stove age, stove usage, stove wear, and cooking activity that is used to estimate stove usage across the entire project database.

When determining if a person should participate in the Kitchen Survey, each subject is asked whether they have ever purchased a Uganda Improved Stove. If the answer is no, the person is not surveyed. The Detailed Customer Database currently includes customers mostly from warranty cards and some identified through door to door searches in a subset of neighbourhoods designed to capture a wide socioeconomic sample of customers.

7. Third party inputs to Quality Assurance

Quality assurance measures have been implemented by the designated third party monitor, CIRCODU. CIRCODU is a non-profit consortium of expert monitoring consultants based in Kampala, Uganda. Its members are associated with the Medicine, Engineering, and Public Health departments at Makerere University. CIRCODU has extensive experience developing and employing household energy survey tools, and Joseph Arineitwe, the Director, has extensive experience conducting trainings in customer and group assessment. CIRCODU has conducted extensive spot checks on random samples of the Project sales record. They have contacted hundreds of retailers and users to confirm sales and have carefully checked the electronic sales database to check for conservativeness. In order to create an additional means of cross-checking sales figures, CIRCODU works with Manufacturing Partners to implement a system of precise and accurate production and inventory accounting, which are monitored during the quarterly spot checks as an additional check against the sales record. CIRCODU performs the quarterly spot checks and issues the Ugastove Sales Audit Report.

In addition, Mike Ssemwogerere, Impact Carbon's Uganda Business Development Manager and accounting expert, applies random spot checks by calling the phone numbers on warranty cards and in sales records to ensure the validity of information gathered. He does this on a monthly basis to prepare manufacturers for CIRCODU's regular monitoring, such as spot checks and Kitchen Surveys.

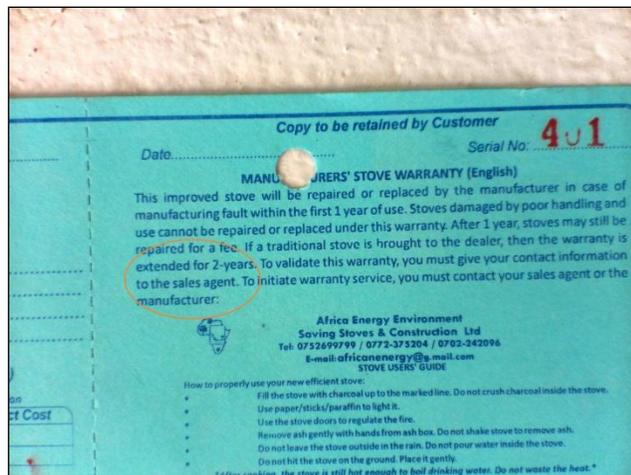
8. Sustainable development indicators

The following table monitors the most sensitive sustainable development indicators:

Sustainable Development Indicator	Monitoring source	Variables, Units and Frequency of Measurements	Monitored result
<i>Air quality</i>	Kitchen Surveys; Kitchen Survey (KS) Monitoring Reports: Annex 02 and Annex 03	<i>Air pollutants (CO, particulates)</i>	<p>As stated in the PDD on page 6, item 2, improved stoves generally reduce indoor air pollution and improve air quality. The Kitchen Survey Report reveals that more than 42% of respondents cook indoors during the dry season, either in the main house or a separate enclosed kitchen. During the rainy season, this increases significantly to about 75%.</p> <p>Quarterly Kitchen Surveys assess quarterly through observations and estimations the impact on air quality. Overall, end users report reduced symptoms of IAP. This monitoring period, 80% of respondents report that their improved stove produces less smoke than the old stove; and 89% report that compared to their old stove, their improved cookstove results in less incidents of dizziness, coughing, difficulty breathing, and children’s sickness. 100% report that it is easier to breathe with the new stove and that pots turn less black.</p> <p>As part of air quality, the Project seeks to find ways to motivate customers to give up their old stoves. This continues to be a challenge. In 2011, the Project ran a “Cash for Clunkers” pilot program, where customers had an opportunity to receive a rebate for bringing in old cookstoves. This resulted in a few stoves being returned, but not at scale. In this monitoring period, flyers were printed that advertised to ability to receive an extended guarantee (2-year warranty) per for bringing in the traditional stove. In addition, World Wide Fund for Nature Uganda office also printed this on their flyers for mass distribution. The extended warranty is increasing in popularity; more than 15% Kitchen Survey respondents report taking advantage of this extended warranty option.</p>



Here is a photo of the extended warranty explanation on the card:



73.60 % of KS households cook with more than one stove. Of those households, all respondents noted that the reason they cook with more than one stove is to cook multiple dishes simultaneously in order to save time. The Project tracks customers' usage of old stoves: Kitchen Survey data indicates that of the customers who use more than one stove, 69% of respondents still include traditional stoves as part of their kitchen regime. Not all are using them on a regular basis.

As the Project uses a subsumed KT approach, the use of alternative stoves and fuels is already captured in the fuel-savings values.

<p><i>Employment</i></p>	<p>Ugastove Employment Records, Ugastove Retailer Records</p>	<p><i>Numbers</i></p>	<p>As Manufacturing Partners grows, they continue to hire and employ Ugandans in administrative, sales, production and management positions. In addition, artisan training has allowed other stove entrepreneurs to open workshops: there are several other stove manufacturers in Kampala who have opened their own businesses after being an apprentice at Ugastove. Refer to Annexes 13 and 14 for employment information. Finally, the livelihood of stove retailers also improves by an increased margin of stove sales. Partners currently have a network of more than 884 retailers (over 200 more than last year). The jobs and emissions reductions generated by the improved stoves of other workshops were supported by carbon finance.</p>  <p>A retail shop owner stands next to his cage full of stoves.</p>
<p><i>Access to Energy Services</i></p>	<p>Monthly Sales Records</p>	<p><i>Fuel cost, consumption, ease of collection</i></p>	<p>Impact Carbon monitors the access that Project Stoves provide for Ugandans to efficient energy technologies through sales records. In this Monitoring Period, Project Partners sell an average of more than 8,000 stoves per month, or more than 300 stoves per day – this is more than a 50% increase just within the past year. Monthly sales records are cross-checked with paper records by Impact Carbon’s Business Development Manager. The sales record is cross-checked on a quarterly basis with production, inventory and labour records by CIRCODU. Additionally, about 80% of Kitchen Survey respondents report that it is easier for them to meet their household energy needs with the Uganda Improved Stove.</p>

<p><i>Lively-hood of the poor</i></p>	<p>Kitchen Surveys; Kitchen Survey (KS) Monitoring Reports: Annex 02 and Annex 03, Ugastove Sales Records (Annex 06), Kitchen Performance Test (Annex 01), CIRCODU Charcoal Price Survey (Annex 09)</p>	<p><i>Financial impact</i></p>	<p>The Project's improved charcoal stoves continue to increase the spending power of lower income Ugandans by reducing the amount families must spend on charcoal. With the increase in fuel prices, charcoal prices have increased significantly over the past year. Poor families are forced to devote ever larger portions of their income to fuel purchase. The Monitoring KT estimates the average fuel savings of domestic users' stoves at 391.41 kg of charcoal per year (as stove performance for HH stoves does not degrade over time this fuel savings stays constant with age). As charcoal prices rise, fuel savings becomes increasingly more important. The average price per kilogram of charcoal has risen every year:</p> <ul style="list-style-type: none"> - 2010: 401 shillings/kg - 2011: 445 shillings/kg - 2012: 701 shillings/kg <p>Given the current price of charcoal (based on 2012 CIRCODU survey data of 44 charcoal retailers in Kampala – 19 in March 2012 and 25 in October 2012), domestic customers alone save an average of UGX 323,000 annually. This means that, in today's exchange, domestic customers save an average of US \$125 per year. On average, for all stove sizes, customers realize even more than that, particularly for those who cook more often. The results of CIRCODU's charcoal price survey can be found as Annex 09 Charcoal Price Survey. 75% of respondents report that they use their financial savings to purchase necessities such as food, water, and clothes.</p> <p>Institutional Stoves save on average more than 54 tonnes of wood per year, freeing up money to spend on other things for their students, patients, business owners, et cetera.</p>
<p><i>Human and institutional capacity</i></p>	<p>Kitchen Surveys; Kitchen Survey (KS) Monitoring Reports: Annex 02 and Annex 03; CIRCODU Spot Check Reports (Annex 11), Ugastove Recordkeeping Systems, Ugastove Production Records</p>	<p><i>Skill levels</i></p>	<p>Using carbon financing, Ugastove continues to invest in trainings that build human and institutional capacity, such as internal control systems, accounting systems, and improved manufacturing systems.</p> <p>Partners employ a set of recordkeeping techniques recommended by CIRCODU and Impact Carbon's business development team. Over time, partners' recordkeeping becomes increasingly robust, as the companies develop streamlined templates to track production, sales, inventory, labour and purchase of raw materials – both for carbon purposes as well as business development. This includes the comprehensive sales tracking system as well as the introduction of a serial pilot program, referenced earlier in the report in Section 2.</p> <p>Staff Training: Ugastove has facilitated professional development opportunities for management staff, such as a Human Resources training course for upper management and QuickBooks training events for the finance department, including data entry staff. The company is currently soliciting expertise from an MBA with</p>

business management and budgeting knowledge who has helped the company develop a framework for an operating budget that empowers the middle management team (coordinating the finance, production, operations and sales departments) with the ability to ensure that each department is performing within budget and also completing all necessary tasks. The finance department manager has also received partial support from Ugastove to attend night-school classes to receive his MBA to better serve the company. The management team has begun having weekly meetings to discuss budget targets, sales goals, and general operations updates. This has facilitated better communication between the departments and is laying the groundwork for the company to grow and begin setting more advanced delivery schedules for large-volume retailers such as Living Goods, who are placing orders for many stoves at a time. Finally, the Business Development Fellow conducted a full-day sales training session to teach marketers best practices for sales and marketing.

Manufacturing Training: Partners have been able to build capacity and provide training to day labourers to enhance their professional development. Training records can be found as part of Partners' recordkeeping, in the labour records. In the production records, which are broken down by employee, trainees are those identified as "student." These logs denote the trainee's activities, such as cutting and welding pot stands, as well as the trainee's pay rate during the training period.



SESSA artisans preparing to finish stoves

<i>Technological self-reliance</i>	Annex 02: Kitchen Survey (KS) Monitoring Report; Charcoal	<i>Achievement</i>	<p>Manufacturing Partners continue to innovate and improve stove technology in Uganda through research and development operations. Partners are increasingly recognized for their work; within this past monitoring period one factory was featured in the Daily Monitor, and another factory applied for and received certification from the Uganda Bureau of Standards.</p> <p>Impact Carbon’s Business Development Team continues to work with partners on recordkeeping and market development. The Makindye factory has also trained many stove builders in Kampala, many of whom are now replicating the design and are included in this project credited in the same cluster.</p>
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Appended files list

Project Annexes

- ISS5 Annex 01A - KPT Berkeley Air 2010 Phases 1-5
- ISS5 Annex 01B – Aging KPT Monitoring Report, 2012
- ISS5 Annex 02 – KS Monitoring Report; Charcoal
- ISS5 Annex 03 – KS Monitoring Report; Institutional Wood
- ISS5 Annex 04 – Usage Monitoring Report, Charcoal
- ISS5 Annex 05 – Usage Survey Monitoring Report, Institutional Wood
- ISS5 Annex 06 – Complete Sales Record and Project Database
- ISS5 Annex 07 – Detailed Customer Database
- ISS5 Annex 08 – Customer Sampling Record
- ISS5 Annex 09 – Charcoal Price Survey
- ISS5 Annex 10 – Partner Retailer List
- ISS5 Annex 11 – CIRCODU Sales Audit Report Summary
- ISS5 Annex 12 – Partner Marketing Strategy
- ISS5 Annex 13 – Organizational Charts
- ISS5 Annex 14 – Partner Staff Lists
- ISS5 Annex 15 – Days in Inventory Analysis Writeup
- ISS5 Annex 16 – Days in Inventory Calculation Spreadsheet
- ISS5 Annex 17 – Letter from The Gold Standard, Inclusion
- ISS5 Annex 18 – Usage Survey Data Analysis, Charcoal
- ISS5 Annex 19 – Letter from Gold Standard, Aging KT
- ISS5 Annex 20 – Usage Survey Data Analysis, Institutional

ER Calculations:

1. 1Apr12 – 31Dec12 Charcoal Calcs
2. 1Apr12 – 31Dec12 Institutional Wood Calcs
3. Summary ERs