

ISSUANCE 1 MONITORING REPORT



Jan 01, 2013 –
Mar 31, 2014

GS1321 Stove Capital Guatemala Improved
Stove and Water Purification Project

Monitoring Period:
01 January 2013 – 31 March 2014

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Report submitted by:
The Paradigm Project

Issuance 1 Monitoring Report

GS1321 STOVE CAPITAL GUATEMALA IMPROVED STOVE AND WATER PURIFICATION PROJECT

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1. ABBREVIATIONS

BFT- Baseline Field Test
BWBT- Baseline Water Boiling Test
CBO- Community Based Organizations
COV- Coefficient of Variation
CRW- Carbon Rights Waiver
DCD- Detailed Customer Database
ER- Emission Reductions
FAR- Forward Action Request
GS- Gold Standard
KPT- Kitchen Performance Test
LPG- Liquid Propane Gas
LSC- Local Stakeholder Consultation
MS- Monitoring Survey
MR- Monitoring Report
NGO- Non-governmental Organization
PDD- Project Design Document
PFT- Performance Field Test
SDI- Sustainable Development Indicator
SM- Socorro Maya
TPDDTEC- Technologies and Practices to Displace Decentralized Thermal Energy Consumption
TSR- Total Sales Record
US- Usage Survey
WCFT- Water Consumption Field Test
WQT- Water Quality Test

2. INTRODUCTION

The following report documents the GS1321 Stove Capital Guatemala Improved Stove and Water Purification Project activity during the Issuance 1 Monitoring Period (01 January 2013 – 31 March 2014).

The project promotes the use of improved stoves and water treatment technologies, and in turn generates carbon credits in the voluntary market based on the greenhouse gas emissions reductions of these technologies. The project works through local organizations, NGOs and distributors to provide Guatemalans with healthy and efficient cooking technologies and greater access to safe drinking water. The revenues from carbon finance are invested into subsidies, social marketing, and the development of robust distribution channels to further support the growth and impact of the project.

a. Project Partners

- **The Paradigm Project (Paradigm)** is an international social enterprise specializing in the development of clean cookstoves projects and leverage carbon finance for scale and sustainable supply chain development. The Paradigm Project has partnered with Stove Capital LLC to finance the development of a carbon program in Guatemala and to facilitate processes for tracking and monitoring of the project.
- **Socorro Maya (SM)** is a non-profit Guatemalan organization with the goal of serving the humanitarian needs of the poor. Socorro Maya focuses on helping the “living Maya” with their greatest needs for health and well-being. Self-reliance for the Maya depends first on the replacement of indoor open cooking fires with highly efficient cooking stoves. Once that is in place, a water purifier is their next greatest need. Socorro Maya distributes the Eko-stove and Ecofiltro to Guatemalan communities and provides training and follow-up to ensure technologies are used correctly. Socorro Maya distributes all technologies under Project Scenario 2.
- **Ecofiltro** is a Guatemalan business created to manufacture and market the locally designed Ecofiltro water purification device. Ecofiltro is a company established on the belief that business practices and sustainable markets can more effectively address the lack of access to clean drinking water in Guatemala. Ecofiltro manufactures and distributes the Ecofiltro technology under Project Scenario 1. EcoFiltro conducts both bulk sales to organizations working in target communities and direct sales to households with training and follow-up.

The Project was registered by the Gold Standard (GS) Foundation on June 28th 2013, under the GS Methodology - Technologies and Practices to Displace Decentralized Thermal Energy Consumption - 11/04/2011. The Project Design Description is provided in [Annex 20 GS 1321 PDD](#). The Local Stakeholder Consultation for the project was conducted on the 4th of September 2012, and the Passport and LSC Report were submitted to the Gold Standard and uploaded to the registry on the 10th of October, 2012. After the Gold Standard review the project was officially listed on the registry on November 13th, 2012. The construction and distribution of technologies included under the project began on January 1st, 2013, in line with the start date described in the PDD. The project continued to distribute and manufacture technologies, scaling distribution as the project grew. The crediting period of the project is 7 years, from January 1, 2013 to December 31, 2019, with the option of renewing the crediting period after December 31, 2019.

The Issuance 1 monitoring period of GS1321, includes all sales of Ecofiltro filters and Eko-stove stove to rural households in Guatemala from January 1st 2013, the start date of the project, to March 31st 2014. The start date of the project is after the time of first submission, the submission of the Passport and LSC Report on October 10, 2013, thus the project falls under the regular cycle. The Issuance 1 Monitoring Report (MR) documents the implementation, monitoring, and emissions reductions of the project activity as described in the GS1321 Project Design Description.

Summary of Issuance 1 Project Activity:

- 1,869 improved wood stoves sold/installed during this monitoring period
- 22,314 filters sold/installed during this monitoring period
- 4,431 tons CO₂e reduced from improved stove technologies
- 50,415 tons CO₂e reduced from water treatment technologies

3. PROJECT DESCRIPTION & SUMMARY

a. Project Technologies

The Project disseminates clean cooking and safe water treatment technologies throughout the Guatemala. The GS1321 PDD includes descriptions of the two technologies included in the project activity, the Eko-stove and Ecofiltro.

Eko-Stove Model

The Eko-stove was designed by engineers at CEMEX with the support of local partner Socorro Maya and international improved stove design expert, Peter Scott, and the Burn Design Lab. The stove is a large metal plancha stove made up of cinder blocks and concrete. The thermal efficiency of the stove is 15.4% and the stove has a power output of 8.95kW. The stove is locally appropriate for all Guatemalan cooking needs, providing beneficiaries ample space to cook tortillas and large meals. The stove has an estimated lifetime of 10 years. Socorro Maya is the local Project partner responsible for the sales and installations of Eko-stoves.



FIGURE 1 EKO-STOVE PHOTO

Ecofiltro Model

The Ecofiltro is manufactured locally by Ecofiltro S.A. The filter purifies water by a gravity fed porous ceramic filtration element. The ceramic element has a pour size of 0.6 to 0.3 microns and is lined with colloidal silver which helps to remove particles from and disinfect the filtered water. The filter has a flow rate of 1-2 liters per an hour and a maximum capacity of 20 liters, and meets filtered water meets drinking water standards set by the WHO and Coguanor of Guatemala¹. The ceramic element has a lifespan of at least 2 years. Ecofiltro S.A is the local Project partner responsible for the sales and installations of Ecofiltro water filters.



FIGURE 2 ECOFILTRO PHOTO

¹ Annex 14 GS1321 Iss. 1 Water Quality Report



FIGURE 3 ECOFILTRO FILTRATION ELEMENT

b. Baseline & Project Scenarios

The Project Design Document states that the baseline scenario includes “Household biomass users” which consists of a biomass fuel in unimproved open fires used for domestic purposes. The monitoring conducted for Issuance 1 found that beneficiaries of the project were representative of the baseline scenario prior to receiving the project technologies. Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report, shows that all project stove end users reported using fuelwood before receiving the Eko-stove, with 5% indicating some sort of fuel mixing of wood with LPG or Biogas. Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report shows that 92% of the water filter end-user population that was not using a non-boiling treatment mechanism in the baseline were using a 3-stone or unimproved wood stove.

The Project Partner’s distribution models define the project scenarios.

Project Scenario 1 – Water Treatment only

Project Scenario 1 includes all EcoFiltro distributions that are not disseminated along with an improved stove technology. This project scenario consists of household water treatment technologies that displace the use of biomass for water purification. Since the emission reductions equation and target population for the water treatment technologies are the same as those of Project Scenario 2, all water filters were monitored together.

Project Scenario 2 – Improved Cookstove & Water Treatment, Dual Installation

For Socorro Maya distributions, the project scenario consists of the dual implementation of both household improved wood stoves and water treatment technologies, which replace biomass for water purification and allow for the efficient use of biomass for cooking. Since the emission reductions equation and target population for the water treatment technologies are the same as those of Project Scenario 1, all water filters were monitored together.

Project Scenario 3 – Improved Cookstove only

Consists of households using project improved cookstove technologies that allow for the efficient use of biomass for cooking. During this monitoring period no households received only an improved cookstove as there was a demand for both products. At this point in time supplying both technologies at the same time is economically advantageous and provides a more holistic solution. Thus Socorro Maya strives to distribute technologies together, though there is the possibility of this changing in the future. Project Scenario 3 is not described in additional sections of the Monitoring Report because it is not currently being implemented.

4. IMPLEMENTATION OF PROJECT

a. Manufacturing & Distribution

The Project continues to focus on improving and streamlining manufacturing processes and maintaining high quality products. The improved stoves and water filters included in Issuance 1 are both manufactured locally in Guatemala. As the Project grows, carbon revenues will be used to expand and streamline manufacturing.

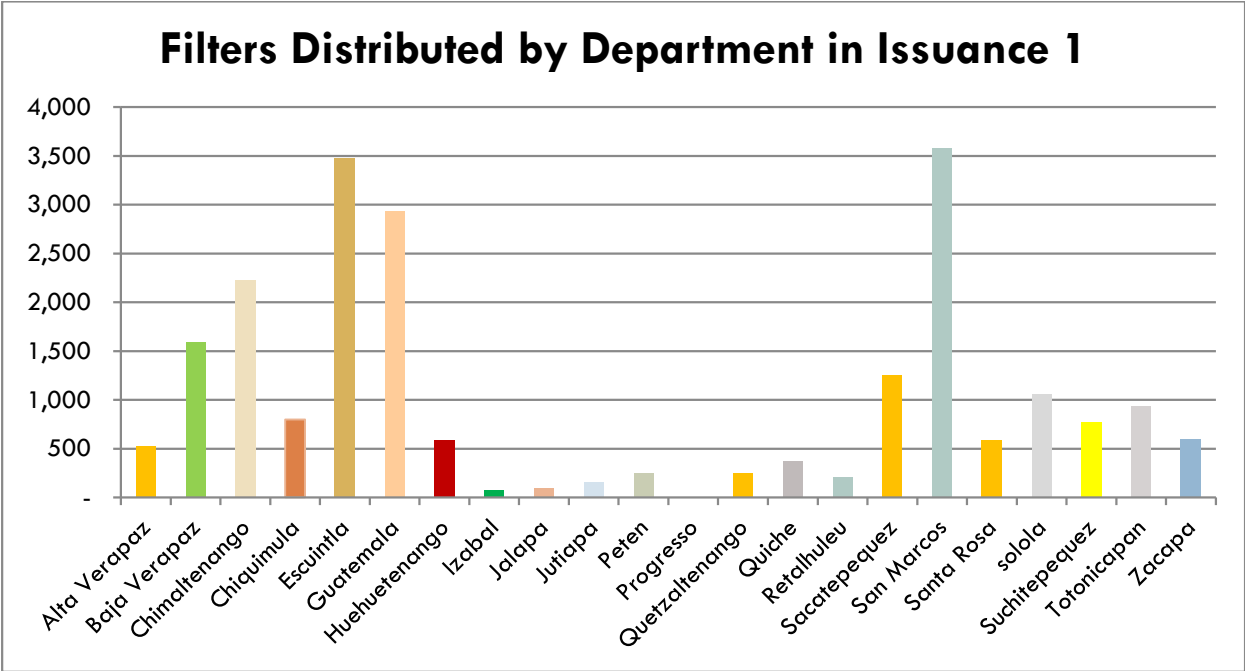
For the sales and distribution of Project technologies, various distribution channels are used in order to make products accessible to the target population. Socorro Maya distributes improved stoves along with Ecofiltro water filter technologies directly to consumers, often working with local banks to provide loans and payment plans allowing households to pay for the technologies over time. Socorro Maya has started distribution in the Departments of Alta Verapaz, Baja Verapaz, and San Marcos, as these departments have the most need and demand, but plans to reach other regions as the project expands. Graph 2 below indicates the relative distribution for each of the aforementioned departments. The Eko-stove is manufactured locally in Guatemala by Cemex. This monitoring period includes 1,869 stoves which is 2% of the planned sales over the life of the project.

Ecofiltro is the filter manufacturer and distributor. Ecofiltro distributes some filters through local NGOs/CBOs who provide filters free of charge or at a subsidized rate. Working with NGOs/CBOs enables Ecofiltro to expand their reach and target end-users who may not be able to afford the technology. Ecofiltro also distributes filters directly, often offering financing, making the filter more accessible. These distribution mechanisms continue to evolve as the project grows and new opportunities arise. Ecofiltro is currently distributing filters to all departments of Guatemala, except El Progreso, as demonstrated in Map1 and Graph 1 below. The project intends to target all departments within the project boundary of Guatemala. Initial project implementation has been focused in areas with the highest demand and support from partner organizations and community leaders. The project intends to distribute filters in the department of El Progreso, but has not been able to find appropriate partners or community support to execute the project in this region yet. Only direct filter sales to rural communities or bulk sales to NGOs/CBOs working in rural communities are included in the project, 937 filters which were sold to for profit companies for use in community projects were excluded from the project to remain conservative. This monitoring period includes the sale of 22,314 filters to rural communities, which is 3% of the planned sales over the life of the project. The project plans to invest revenues generated by carbon finance to help scale sales to reach distribution targets.

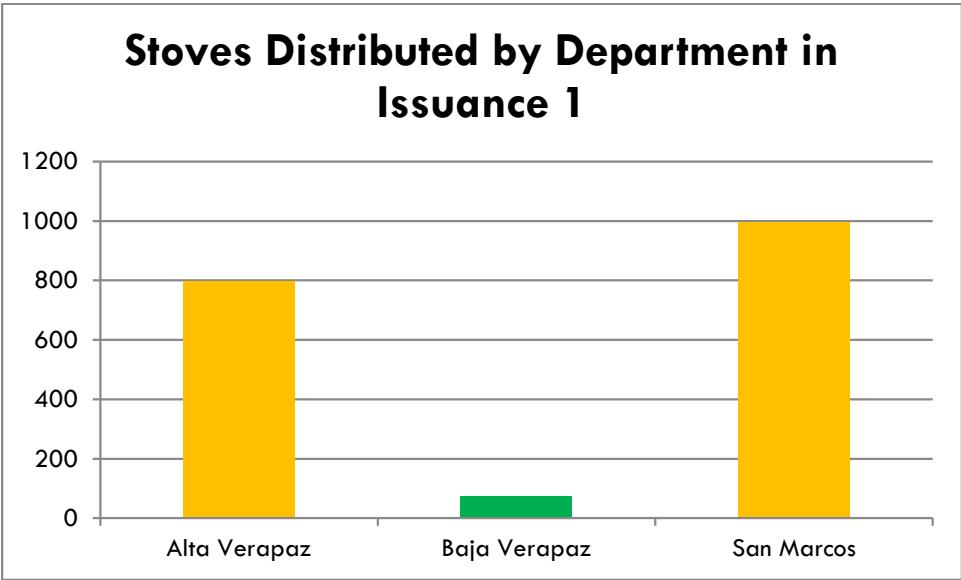
MAP 1 DEPARTMENTS OF GUATEMALA



GRAPH 1 DISTRIBUTION OF FILTERS BY DEPARTMENT



GRAPH 2 DISTRIBUTION OF STOVES BY DEPARTMENT



Below is a description of the implementation systems and partners

TABLE 1 IMPLEMENTATION AND SYSTEMS AND PARTNERS

Organization	Role
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Socorro Maya	Distributes all Project Scenario 2 technologies (combos of dual technologies which include the Eko-stove and Ecofiltro). Socorro Maya manages the manufacturing of eko-stoves and is the sole distributor of the technology. Socorro Maya sources filters from Ecofiltro, similarly to other NGOs/CBOs purchase filters from Ecofiltro
Ecofiltro	Ecofiltro manufactures and distributes the Ecofiltro. Ecofiltro distributes filters directly to end-users as well as to NGOs/CBOs
Partner NGO/CBOs	Partner NGOs/CBOs purchase filters from Ecofiltro and distribute them to end-user representative of the target population

b. Record Keeping

PROJECT SCENARIO 1 (WATER TREATMENT ONLY):

Ecofiltro tracks all bulk sales to clients including Socorro Maya, Ecofiltro One, Ecofiltro S.A., and other partner NGOs/CBOs, through sales invoices. At the moment only sales to NGOs/CBOs working in rural areas and direct sales to rural areas through Ecofiltro are included in the project. Ecofiltro management communicates with NGOs/CBOs to ensure they are targeting rural households as end-users. Ecofiltro has provided signed documentation or website addresses for each entity to demonstrate that they are either an NGO or CBO. In the sales invoice Ecofiltro records the client's name, quantity of filters, client's address, and the date of the sale. A carbon copy of this sales invoice is stored at Ecofiltro's factory and records are also stored electronically. Ecofiltro also tracks the date of delivery for most sales through the use of a Delivery Note, which corresponds to the sales invoice and indicates the date when the filters were delivered and a description of where they were installed. A lag analysis is conducted to determine the time differential between the date of sale and the installation of the filters. Ecofiltro also tracks end-user information either directly at the point of installation through the use of Ipad technologies or through partner NGOs/CBOs. End-users have access to replacement technologies, as Ecofiltro's phone number is located on the filter, and Ecofiltro explains the warranty to end-users and NGOs/CBOs.

PROJECT SCENARIO 2 (IMPROVED COOKSTOVES & WATER TREATMENT, DUAL INSTALLATION):

Socorro Maya is the sole distributor of stove technologies, and distributes all stoves with an Ecofiltro. Thus all Socorro Maya sales pertain to Project Scenario 2. Socorro Maya stove and filter sales tracking is quite rigorous, as many end-users are on payment plans or have received loans, so it is essential to collect accurate end user details. Each end-user who receives a stove and filter signs a contract stating that they will remove their old stove and waive their carbon rights. Socorro Maya also tracks detailed customer information including the end-user name, product serial number, date of installation, phone number and gps coordinates whenever possible. This data is recorded on paper forms, and transcribed into an excel customer database. Socorro Maya's comprehensive record keeping ensures that all sales are accounted for, and allows for follow up with beneficiaries to ensure technologies are working properly. All filter sale information is sent to Ecofiltro, as emission reductions for filters in Project Scenario 1 and Project Scenario 2 are calculated and monitored together. An operations manual documenting record keeping procedures can be found in **Annex 26 Socorro Maya Operations Manual**

Below is a description of the recording keeping and data management operations and responsibilities

TABLE 2 RECORD KEEPING AND DATA MANAGEMENT OPERATIONS AND RESPONSIBILITIES

Organization	Role
The Paradigm Project	Management of partner organizations, compilation of master TSR and DCD. Reviews and cleans datasets. Maintains and stores the master databases electronically, which are provided by Ecofiltro and Socorro Maya. The Paradigm Project uses the databases provided to calculate Emission Reductions.
Socorro Maya	Distribution of all Project Scenario 2 distributions, and management of stove manufacturing. Collection and entry of end-user data and records used to populate the TSR. Responsible for storing hard copies of sales receipts and end-user information, as well as transcribing this data into excel spreadsheets. Sends completed datasets to The Paradigm Project for review cleaning, and calculation of Emission Reductions
Ecofiltro	Manufacturing of filters and distribution to end-users or NGOs/CBOs. Collection and issuance of receipts for all sales. Responsible for storing and maintaining this data and records, which are used to compile the TSR. Collection of end-user data and compilation of end-user data collected by partner NGOs/CBOs used to populate the DCD. Ecofiltro transcribes all data into excel spreadsheets. Sends completed datasets to The Paradigm Project for review, cleaning and calculation of Emission Reductions

Map 1 and Graphs 1 and 2 above demonstrate the distribution of project technologies across the project boundary.

5. OVERVIEW OF MONITORING CONDUCTED IN ISS 1 MONITORING PERIOD

Since this was the first monitoring period of the project, the PP conducted Performance Tests, Usage Surveys and Monitoring Surveys. For improved wood stoves in Project Scenario 2, a water filter was first given in order to remove any wood used in the baseline for boiling from the baseline scenario, then a paired Baseline Fuel Test and Project Fuel Test, was conducted to assess fuel savings resulting from the use of the Eko-stove. Improved stove Monitoring and Usage surveys were also conducted in tandem, as per the methodology allowance. Water filters from Project Scenario 1 and 2 were monitored together, as the technology, emission reductions calculations in the PDD, and target population are the same for both Project Scenarios. The implementation of stove technologies distributed in combination with water filters in Project Scenario 2 does not affect the emission reductions associated with water filters in this Project Scenario, as the improved stove has no effect on water consumption, the quantity of fuel used to boil water is based off of the stove in use prior to implementation of the project, and all monitored filter parameters are independent of stove usage. Thus, there is no significant difference in the use of water filters and characteristics of population in Project Scenario 1 and 2. Since emission reduction calculations for each technology type in Project Scenario 2 are completely separate, monitoring can be conducted independently for each technology. Thus the PP elected to include the water filter portion of the monitoring in Project Scenario 2 with that of Project Scenario 1. As stated previously this was justifiable as the technology, fuel type, and emission reductions calculation were the same from both Project Scenarios. Filter sales from both Project Scenarios were included in the sampling frame, and survey participants had characteristics of typical end users in both project scenarios. Additionally sustainable development monitoring of filters is conservative as it allows the PP to disaggregate the effects associated with the use of filters from that of stoves, and ensure that both technologies contribute to Sustainable Development. Water Consumption Field Tests (WCFT), Usage Surveys, and Monitoring Surveys

were all conducted on the same population. Baseline Water Consumption Tests were conducted in the field in June of 2014.

The Paradigm Project oversaw all monitoring of the project and coordinated activities between distribution partners, monitoring partners, training partners, and statisticians. The same management structure was applied for both Project Scenarios. Surveys were developed by Paradigm and Impact Carbon, in line with their experience with similar projects. All surveys were reviewed by Socorro Maya, Ecofiltro and the local monitoring team (Green Development) to ensure they were appropriate for the local Guatemalan context. All monitoring was conducted by a third party monitoring group, Green Development. Green Development is a local environmental consultancy firm specializing in environmental impact reporting, carbon footprint analysis, and carbon monitoring. Green Development was trained by Impact Carbon and Zamorano University, a Honduran University recognized as a regional testing center by the Global Alliance for Clean Cookstoves, <http://community.cleancookstoves.org/partners/item/11/234>. Green Development senior staff provided additional training to enumerators and reviewed and cross-checked all data-entry to ensure there were no errors. Explanations and records of trainings can be found in **Annex 27 Green Development Training Attendance**, **Annex 28 Water Filter Monitoring**, and **Annex 29 Stove Filter Monitoring**. Green Development provided raw datasets to The Paradigm Project who analyzed the data and reported the results. The BWBT field test was conducted in the field with the support of Josh Lazarus, Roger Perez (Peace Corps, Stoves Specialist), and local community members.

The PP conducted paired Fuel Tests, conducting BFT (Baseline Field Test) and PFT (Project Field Tests) on the same households, thus the PP selected samples from a pre-sales list representative of participants from the sales database for the initial baseline (BFT) portion of the test. Socorro Maya provided a pre-sales list which included names of households who were part of Socorro Maya's normal stove distribution who had committed to purchasing stoves during the period of stove monitoring, simple random sampling was implemented to select household for BFT and PFT from this list. For Monitoring Surveys (MS), Usage Surveys (US), and Water Field Consumption Tests (WCFT) the PP elected to use a multi-stage sampling approach due to logistical challenges associated with monitoring technologies within the project boundary using biomass fuel in unimproved stoves, as the PP could not randomly select households in rural communities across the entire country of Guatemala. Since an approach other than simple random sampling was used, the PP hired a 3rd party statistician, Chris Sullivan, to develop the sampling plan. The sampling plan and Chris Sullivan's CV can be found in **Annex 16 GS1321 Iss. 1 Statistician Sampling Plan** and **Annex 17 Chris Sullivan CV** respectively. A brief summary of the sampling plan is included in the description of each monitoring test below, and for more details regarding the communities selected please view the full report referenced for each study.

Below is a description of entities that participated in monitoring and their respective responsibilities.

TABLE 3 MONITORING ROLES AND RESPONSIBILITIES

Organization	Responsibilities
The Paradigm Project	Management of partner organizations, development of surveys, monitoring training, data analysis and reporting. Also responsible for report writing, Emission Reduction Calculation, GS and DOE communications. Completed surveys and datasheets are provided to the Paradigm Project, who then stores them and uses the data to calculate Emission Reduction Calculations.
Green Development	Revision of surveys for local context, conducted monitoring, enters raw data from survey, conducts QAQC analysis of data entry. Green Development filled out paper surveys in the field and transcribed the raw data into excel databases. Provides The Paradigm Project with raw survey data.
Socorro Maya	Revision of surveys for local context, logistical support, and introductions to communities

Ecofiltro	Revision of surveys for local context, logistical support, and introductions to communities
Zamorano University	Monitoring training and revision of surveys
Chris Sullivan Roger Perez	Sampling design, sample size calculations, and sample selection Provided support with Field BWBT testing and surveys

a. Improved Stove Fuel Tests (Project Scenario 2)

For the stove Fuel Tests the PP implemented a Kitchen Performance Test (KPT), in line with guidance in the TPDDTEC methodology. Paired KPTs were conducted to determine the fuel consumption savings associated with the use of the Eko-stove. Due to the nature of paired sampling, samples could not be selected from the sales database, therefore a pre-sales list was used to select households. The TPDDTEC methodology indicates that for paired samples which shall meet 90 /30 confidence and precision the minimum size is 30, but the size should be determined by assuming a typical variation of Coefficient of Variation (COV) using table below.

TABLE 4 GOLD STANDARD 90/30 SAMPLE SIZE ESTIMATION TABLE

COV	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
90/30 Precision	45	53	61	70	80	90	101	112	124

A median COV of 1.6 was estimated, which resulted in a minimum sample size of 80, and a total of 81 households were surveyed. Surveys were conducted in the following communities.

TABLE 5 KPT COMMUNITIES

Community	Department	N	%
Chitul	Alta Verapaz	9	11%
Chixajau	Alta Verapaz	4	5%
Santa Cecilia Chajaneb	Alta Verapaz	7	9%
El Eden	San Marcos	19	23%
Loma Linda	San Marcos	13	16%
Las Guayabas	San Marcos	23	28%
San Vicente	San Marcos	6	7%
Total		81	100%

All survey participants were provided an Ecofiltro prior to the paired KPT to ensure that boiling associated with water treatment was not included in the KPT. KPT training was provided by Zamorano University and included a three day training and pilot survey, in which enumerators learned proper fuel measuring and surveying techniques. The PP elected to quantify fuel savings on a per meal basis, due to the Guatemalan context of cooking an entire meal on a single stove while also allowing the fire to die out after cooking the meal. . To determine the fuel savings per a household per day the PP multiplied this value by the number of person meals cooked per day reported in the Monitoring Survey. Breakfast, lunch, and dinner, were all considered one meal, but snacks were weighted as quarter of a meal. The paired KPT demonstrates that the use of the Eko-stove saves households 2.05lbs per a person meal (or 0.0009 tons of fuelwood/person meal/day). Though significant variation was observed between fuel savings of households in the departments

of Alta Verapaz and San Marcos. Alta Verapaz fuel savings were 1.23 lbs per person meal (.0006 tons/person meal/day) where fuel savings in San Marcos were 2.32(.0011 tons/person meal/day) lbs per a person meal. To reduce regional bias the PP calculated an average fuel savings weighted by the proportion of installations in each region². The weighted fuel savings used in Emission Reduction calculations is 0.00082 tons of fuel wood per person meal. A full description of the KPT can be found in **Annex 4 GS1321 Iss. 1 KPT Report 2014** and **Annex 5 GS1321 Iss. 1 KPT Data**

b. Improved Stove Monitoring Survey (MS)/Usage Survey (US) (Project Scenario 2)

Monitoring Surveys and Usage Surveys were conducted on the same population, to determine the usage rate of the stove as well as household characteristics, typical cooking practices, and sustainable development indicators. Due to the distribution strategy (distribution at the community level) and large distance between communities, the PP elected to select samples using a multi-stage sampling approach. Chris Sullivan, a statistician, created a sampling plan and divided the sales database into 27 sampling clusters with 20-24 households in each cluster. The clusters were defined as communities, the geographic unit which filters were distributed in and the most appropriate for multi-stage sampling. To reduce variance in cluster size, 8 sampling clusters were created by splitting each community (4 in total) with more than 43 households into two separate sampling clusters and 7 sampling clusters were created by merging communities with fewer than 15 households together from proximate geographic areas. Only stoves that were over two months old were included in the sales database, as the communities were selected in December to give ample time to plan the study. This also ensured that data collected was representative of older stoves.

Chris Sullivan calculated a minimum sample size of 2 communities with 20 households each, using sample size equations from CDM guidance in Executive Board Meeting 75 Annex 8 for multi-stage sampling meeting 90/10 confidence and precision. A total of 5 sampling clusters were selected, as per the PDD the minimum sample size for distributions over 1000 technologies is 100. This resulted in the selection of 8 communities with 5 to 24 households per community, as some sampling clusters included multiple communities. The table below shows households sampled by community. As per the methodology allowance, all required US & MS were conducted on the same population. Usage questions were asked first and then if the stove was found to be in use, enumerators proceeded with the full MS questionnaire. A detailed description of sampling size calculations and sampling methods can be found in Annex **16 – GS1321 Iss. 1 Statistician Sampling Plan**

TOTAL SURVEYS COMPLETED

TABLE 6 STOVE MONITORING SURVEY AND USAGE SURVEY COMMUNITIES

Community	Municipality	Department	N	%
Caquiton	San Pedro Carchá	Alta Verapaz	14	13%
Chexena	San Pedro Carchá	Alta Verapaz	5	5%
Chirrequin	San Pedro Carchá	Alta Verapaz	24	22%
Chitzunum	San Pedro Carchá	Alta Verapaz	8	7%
Esperanza Sehubub	San Juan Chamelco	Alta Verapaz	6	6%
San Luis	San Juan Chamelco	Alta Verapaz	22	21%
Santa Ana	San Juan Chamelco	Alta Verapaz	23	21%

² Please note that fuel savings in Alta Verapaz were conservatively applied to Baja Verapaz stove installations due to the close proximity of the two departments.

Saquiñ	San Pedro Carchá	Alta Verapaz	5	5%
TOTAL			107	100%

Training for the surveys was provided by Zamorano University in congruence with KPT training. Additionally Green Development senior staff reviewed the survey with enumerators and provided additional training prior to the implementation of the survey. A usage rate of 92.4% was derived from the survey, which also takes into account continued use of baseline stoves for certain cooking practices. The monitoring survey also indicates that households cook an average of 16.89 meals per day, which is multiplied by the fuel savings value monitored in the KPT to calculate fuel savings per day. The survey also assessed sustainable development indicators, for which a full description can be found the Sustainable Development Impact section below. A full description of these surveys can be found in **Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report** and **Annex 9 GS1321 Iss. 1 Stoves - 2014 KS & US Data**.

c. Water Filter Monitoring Survey (MS)/Usage Survey (US) and Water Consumption Field Tests (WCFT) (Project Scenario 1 & 2)

All water filter surveys (Monitoring Surveys MS, Usage Survey US, and Water Consumption Field Tests WCFT) were conducted on the same population. The PP elected to use a multi-stage sampling approach due to logistical complication of monitoring such a large quantity of filters distributed in 21 departments across Guatemala. A statistician developed the sampling plan and sampling clusters. The statistician created sampling clusters which included sales from Ecofiltro, Partner NGOs/CBOs, and Socorro Maya. Sampling clusters were classified by communities, with 23 to 46 households, as each filter distribution targeted a certain community. Due to the size and ease of identification of communities combined with the fact that filter distribution is done at the community level, community clusters were selected as the multi-stage sampling unit. The sampling frame included sales from Project Scenario 1 and Project Scenario 2, as monitoring included both scenarios due to both scenarios having the same emission reduction calculation and target end-user. Sales were divided into 268 sampling clusters representative of the all sales within the Total Sales Record. Some sales were not included in the sampling frame as they were too small and did not meet the minimum sample size requirement per sampling cluster or too large to obtain community level data necessary for multi-stage sampling. To ensure that these types of sales were included in the sampling frame some larger sales were divided into sub-clusters and some smaller sales were combined in sampling clusters. In total 7,529 households were included in the sampling frame. The sampling frame was representative of all sales in the TSR as it included all sales in the DCD. The total number of filters included in the sales database at the time the sample was selected was 12,433 filters across 60 partner distributors. The Sampling frame included 7,529 filters across 59 distributors account for 60% of sales and 98% distributors. The sample size was calculated using the multi-stage equation in CDM Guidance, Executive Board Meeting 75 Annex 8. Data from the baseline study conducted by Berkeley Air was used to estimate the standard deviation and mean, necessary for the sample size equation. To minimize travel expenses, we decided in advance to randomly select 20 households from each cluster. The resulting calculations indicated we would need to sample approximately 5 clusters of size 20 to meet the 90/10 requirements. This also fulfills the sample size requirements outlined in the PDD, that for technology distributions over 1000 a minimum sample size is required. The PP elected to sample more than 20 household in order to ensure the minimum sample size was met, selecting 5 sampling clusters (communities) with 24 households to be surveyed within each sampling cluster (community). Due to non-participation, non-use of filters, or results being classified as outlier, a total of 117 households participated in the US, of these 114 participated in the MS, and of these 104 participated in the WCFT.

TABLE 7 FILTER WCFT, USAGE, AND MONITORING SURVEY COMMUNITIES

Cluster Name	Municipality	Department	Community	US Surveys	MS Surveys	WCFT Surveys	WCFT Outliers Removed
Ecofiltro: Sacala Las Lomas	San Martin Jilotepeque	Chimaltengango	Sacala las Lomas*	24	22	21	3
St. Joseph's Church: El Pino	Ixhuatan	Santa Rosa	Pino	24	24	22	2
Plan Internationl: El Aguacate	Salama	Baja Verapaz	El Aguacate	24	24	23	1
Ecofiltro: Satelite	Prt. San José	Escuintla	Satelite	22	22	22	0
Ecofiltro: Madrid	Escuintla	Escuintla	Madrid	23	22	16	7
Total				117	114	104	13

The US indicates that 97.44% of filters are in use, as this percentage of households reported meeting all usage criteria which align with GS guidance. MS indicate that there are 5.69 people drinking per filter. The MS also indicates that 20.18% of the project population was already using a non-boiling safe water supply, which is larger than the 9.655% reported in the baseline. Thus the PP has elected to apply an adjustment factor to increase C_j to 20.18%. Additionally the PP found that 17.54% of respondents used LPG stoves, though 85% of these households also treated their baseline water appropriately and were already removed from ER calculations through C_j . The PP elected to account for households using LPG stoves in the baseline and boiling water by applying an adjustment factor to $N_{py.wt}$ (reduction of 2.63%). The MS also collected data concerning sustainable development indicators, for which a full description of data collected can be found in the Section 8. Sustainable Development Impact of this report. The WCFT directly measured water consumption, demonstrating that beneficiaries consume 3.29 liters per person per day. Additionally the WCFT asked respondents to indicate how much of this water was subsequently boiled, demonstrating that on average beneficiaries boil 0.19 liters per person per day of filtered water. A full description of the aforementioned water filter surveys can be found in **Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report**, **Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data**

d. Water Quality Test (WQT) (Project Scenario 1 & 2)

The project has opted for the option outlined in the PDD, where “in cases where the effectiveness of project technologies may be indicated reliably through proxies, such as reliable evidence that they are being maintained and used correctly in accordance with manufacturers’ or installers’, then the FTs may capture such evidence of water quality in place of chemical and biological indicator tests.” Manufacturer’s specifications state that the filter has a minimum lifespan of 2 years, when used correctly, as demonstrated by multiple studies and laboratory tests. Some of these tests include Ministry of Health Laboratory tests³, Private Laboratory Tests⁴, and University Studies⁵. To demonstrate that filters were used correctly, as part of the MS, respondents were asked if they were trained as to how to properly use the filter and enumerators observed the filter for signs of damage. All water is stored properly as safe water filtered water is stored safely

³ http://ecofiltro.com/sites/default/files/analisis_ecofiltro.pdf

⁴ http://ecofiltro.com/sites/default/files/Filtro_2057.pdf

⁵ http://ecofiltro.com/sites/default/files/Results_20letter_20Missouri_U.pdf

within the filter. Additionally enumerators measured the consumption of water during WCFT, and thus observed that filters were being used correctly. All respondents reported being trained and filters appeared in good shape so it can be determined that the filters are performing as per manufacturer specifications. A full report can be found in **Annex 15 GS1321 Iss. 1 Ecofiltro Water Quality Test**

e. Baseline Water Boiling Test (BWBT) (Project Scenario 1 & 2)

During the 8-week validation review, **Annex 21 GS1321 8-Week Validation Review**, the GS raised a Forward Action Request (FAR #4) regarding parameter Wb,y (Quantity of wood fuel required to boil 1 litre of water). The PP validated a value of 919g/l based on tests conducted by Zamorano University in September of 2012. The Forward Action Request stated that the, “PP shall carry out another BWBT on time for the verification in order to crosscheck the fuel consumption values currently presented in the PDD”. In response to the FAR the PP conducted additional BWBT tests with Zamorano University in March of 2014 to verify the results. These tests measured 310g of wood were needed to boil 1 liter of water. Since values derived from both tests differed greatly, and the PP has been unable to identify the reason for these differences, the PP with guidance from the Gold Standard elected to conduct BWBTs in the field using households representative of the baseline population. Conducting tests in households representative of the baseline population allow for all variables associated with boiling water to be taken into account and ensures tests are representative of the baseline scenario.

The baseline water boiling test (BWBT) is conducted to calculate the quantity of fuel required to purify by boiling one litre of water for 10 minutes using technologies and fuels representative of the baseline scenario (Wb,y). The Field BWBT is based on Water Boiling Test Protocol version 4.2.3 (<http://www.cleancookstoves.org/our-work/standards-and-testing/learn-about-testing-protocols/protocols/downloads/wbt-protocol.pdf>), with modifications so that the test may be conducted in the field using fuels and pots typical in the baseline scenario and allowing for water to boil for 10 minutes as per Gold Standard guidance. A description of the protocol may be found in Appendix 1 within Annex 30 GS1321 Field BWBT Report.

The tests were conducted June 2, 2014 to June 4, 2014 by Roger Perez, Peace Corps Guatemala Stove Specialist and Joshua Lazarus, Independent Consultant in the community of Las Carmelitas, Alta Verapaz. A total of 5 households with stoves representative of the baseline scenario were selected by community leaders to participate in the test. 3 tests were conducted in each household resulting in a total of 15 BWBT field tests. Testing was conducted on two 3-stone fires, two metal grate stoves, and one cinder block stove, representative of baseline stoves in Guatemala, and those tested in Zamorano’s laboratory. Since testing was conducted in households it is the most accurate estimation of fuel wood use, as it is representative of how typical households with unimproved stoves purify water by boiling. These tests took into account variation in stove type, wood type, and pot size, by instructing households to boil water as they would under normal circumstances. Only testing associated with 3-stone fires was applied to Emission Reduction equations, as this is the most prevalent baseline stove. The test demonstrated that 465.14g of wood was needed to boil 1 liter of water for 10 minutes on a 3-stone fire. Both the average of all tests and the average of tests conducted in each household meet 90/30 confidence and precision, complying with the precision and confidence requirements outlined the TPDDTEC methodology. A full description of the testing and protocol can be found in Annex 30 GS1321 Field BWBT Report V3.

TABLE 8 SUMMARY OF FIELD BWBT

Number of tests on 3-stone fires	Average Fuel needed to boil 1 liter of water (g)	Standard Deviation	Confidence	Lower Bound	Precision
6	465.14	173	116	349	25%

To address the FAR raised during the GS 8-week review, the PP replaced the BWBT value reported at validation, 919g, with a more conservative and representative value of 465.14g, which was measured using the field tests described above.

The table below summarizes the monitoring conducted for Issuance 1.

TABLE 9 ISSUANCE 1 MONITORING SUMMARY

Project Technologies	Baseline Performance Field Test (PFT)	Performance Field Test (PFT)	Monitoring Survey (MS)/Usage Survey (US)	Water Quality Test (WQT)	Baseline Water Boiling Test (BWBT)
Improved Wood Stoves (Project Scenario 2)	A Paired KPT was conducted by Green Development in December of 2013 to February of 2014. As described in Section 5.a. of this report.		Annual Usage and Monitoring Surveys were conducted by Green Development in February of 2014. As described in Section 5.b of this report.	N/A	N/A
	<i>Supporting Documents: Annex 4 GS1321 Iss. 1 KPT Report 2014, Annex 5 GS1321 Iss. 1 KPT Data</i>		<i>Supporting Documents: Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report, Annex 9 GS1321 Iss. 1 Stoves - 2014 KS & US Data</i>		
Water Filters (Project Scenarios 1 and 2)	N/A	WCFT were conducted by Green Development in January of 2014. As described in Section 5.c of this report	Monitoring and Usage Surveys were conducted in parallel with WCFTs in January of 2014. As described in Section 5.c of this report.	N/A ⁶	Originally BWBTs were conducted by Zamorano University in September of 2012. Due to a FAR being raised BWBTs were conducted by Zamorano again in March of 2014. Results were still not conclusive so the PP with guidance from the GS conducted field BWBTs in June of 2014, to address the FAR raised during validation. The field test

⁶ No water quality tests were conducted as all filters have been in the field for less than a year and still meet manufacturers' specifications

					assessed the fuel needed to boil 1 liter of water, by measuring the fuel use from local cooks, using local stoves pots and wood. Values obtained during the field testing are the most accurate and representative and will be used for calculating ERs. This is further described in Section 5.e. of this report
		<u>Supporting Documents:</u> Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report, Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data	<u>Supporting Documents:</u> Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report, Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data	<u>Supporting Documents:</u> Annex 14 GS1321 Iss. 1 Water Quality Report	<u>Supporting Documents:</u> Annex 2 GS1321 Laboratory BWBT Report Annex 3 GS1321 Laboratory BWBT Data Annex 30 GS1321 Field BWBT Report,

6. PROJECT DATABASES

a. Total Sales Records (TSR)

Careful attention has been paid to the accuracy of the sales record for both stove and water filter sales. The TSR for each technology is a conservative record of all project technologies that have entered use. As described in the Implementation of the Project section of this report, the sales database for household stoves comes directly from Socorro Maya's sales contracts. The water filter TSR comes from Ecofiltro's sales invoices to Partner NGOs/CBOs, Socorro Maya, and Ecofiltro, thus it includes sales from Project Scenario 1 and 2. For simplicity and ease of reporting Ecofiltro S.A. and Ecofiltro One (the NGO associated with Ecofiltro), were treated as any other NGO. All internal sales and sales to Ecofiltro One were issued invoices and reconciled through Ecofiltro's accounting system which complies with Guatemalan regulations and is regularly audited. Table 10 below provides a summary of the number of project technologies sold/installed during the Issuance 1 Monitoring Period. A summary of the geographic distribution of technologies is demonstrated in Map 1, Graph 1 and Graph 2 above.

STOVES (Project Scenario 2)

The TSR for stoves are collected from sales invoices, and includes each individual stove sold. The database includes the date of installation, end-user's name and contact information (when possible), stove serial number, and the geographic location (community and department). Since all stoves distributed were of the same model, this was not recorded. An integral part of Socorro Maya's sales and customer care process is the filling out a stove registration form that serves to

collect end user contact information. These records are also used for Socorro Maya's internal follow-up processes for warranties and servicing.

Socorro Maya clearly communicates the transfer of carbon rights and the need to dismantle traditional stoves on each sales contract signed by improved stove end-users. A component of warranty registration informs the consumer that enrolling in the warranty program also waives rights to carbon credits associated with the use of the stove. Warranties are invalid if the end-user continues to use their baseline stove.

The stove TSR is used for customer follow-up and sampling for project monitoring. All data is collected in paper form then entered manually into the excel database. The TSR for stove sales includes all 1,869 individual technology sales to end-users during the monitoring period. Please see [Annex 10 GS1321 Iss. 1 Stoves - Total Sales Record](#)

FILTERS (Project Scenario 1 &2)

The TSR for filters was recorded from sales invoices from bulk sales. Due to Ecofiltro's distribution model of distributing filters in batches to NGOs/CBOs and communities, and the difficulties of collecting sales information at the end-user level, the PP elected to track bulk sales as per the methodology. The TSR includes distributors names, the number of technology units in the batch, date of sale, and contact information when available. The technology model was not included as all stove and filter technologies distributed were of the same model. Technology identification numbers and end-user information for Project Scenario 1 and 2 is collected in the Detailed Customer Database (DCD). This project is the sole proprietor of these technologies and thus there is no risk that they will be included in another carbon project.

Ecofiltro distributed 22,314 filters over the monitoring period which includes filters distributed by Socorro Maya in combination with stove distributions (Project Scenario 2). The TSR for Ecofiltro sales includes a list of bulk sales to distributors and can be seen in [Annex 12 GS1321 Iss. 1 HH Filter - Total Sales Record](#) for the TSR of each technology credited during this monitoring period.

GRAPH 3. SUMMARY OF ISSUANCE 1 PROJECT TECHNOLOGY TSR

TABLE 10 QUANTITY OF TECHNOLOGIES DISTRIBUTED

Project Technology	Total Sales
Stoves (Project Scenario 2)	1,869
Water Filters (Project Scenario 1 and 2)	22,314

b. Detailed Customer Databases (DCD) & Carbon Rights Waivers (CRWs)

Since the project is distributing small items to rural households in Guatemala it has proven unreasonable to collect all end-user data. Distributions are normally done in bulk to rural areas, where a large order of filters is delivered to a single location for end-user to collect. There is little time to record end-user information for a large group at once, especially since a large portion of time is spent reaching the community, distributing the filters, and providing training on proper use and maintenance. Partner NGOs/CBOs also cannot be expected to collect all end-user data for the aforementioned reasons combined with their other responsibilities. Due to the direct sales approach and smaller number of units sold stove sales have been able to collect all end-user information, but end-user data collection for filters have

proven difficult due to scale and distribution model. Thus as per guidance in the TPDDTEC methodology the PP has elected to collect bulks sales data for filter sales. The TPDDTEC also requires that the PP collect end-user information that shall be no less the 10 times the survey and field test sample size, and thus the PP has created a separate sales database, the Detailed Customer Database. A detailed description of the DCD is included below. For stove sales a DCD is not needed as all end-user information is included in the TSR, as described in Section 6.a of this report

WATER FILTERS

Ecofiltro records end-user data for direct sales and sales from partner NGOs/CBOs electronically. The Ecofiltro field team use electronic technologies to collect end user contact information, the location of the household, filter serial numbers, and the date of installation, when possible. Some end-users prefer not to provide all information and collecting technology serial numbers proved difficult due to codes being illegible, field teams recording codes inconsistently, and field teams unable to record codes due to the challenges of working in the field. Moving forward the project aims to improve data collection by providing clearer guidance and templates for data collection. For purposes of this verification the PP has only entered the four digit numeric code associated with the filter, as with this code and the date of sale the PP can identify if the filter has been replaced. Similarly to stoves, product types are not tracked as there is only one model. Ecofiltro also collects electronic signatures acknowledging their agreement to the terms of the sale and waive rights to the benefits associated with reduction in carbon emissions. Ecofiltro also collects this data to follow up on filter sales and offer replacement filters once the product has reached its two year lifespan. Ecofiltro attempts to collect as much end-user information as possible, but some direct distributions are done in bulk through local leaders and in remote communities this it is difficult to collect end-user information at the time filters are delivered. This is only a small portion of sales as there are 5988 Ecofiltro direct sales entries in the sales database, but for ease of reporting and to maintain consistency Ecofiltro direct sales are treated as NGO sales. Ecofiltro also under goes internal audits as per Guatemalan regulations, where internal sales are reconciled and Ecofiltro demonstrates that these sales did in fact occur. Additionally Ecofiltro maintains the delivery notes of each sale which further demonstrates that the sale reached the community or distribution points of NGOs/CBOs. The DCD is stored in excel spreadsheets

For indirect sales, Ecofiltro solicits end-user information from all partner NGOs/CBOs. Most filters are distributed in bulk to communities, where all community members receive the filter and are trained at the same time. Similarly to it being unreasonable for retailers to collect end-user data, partner NGOs/CBOs often do not have sufficient time to register all end-user details, as they have other responsibilities and getting to the remote communities, distributing the filters, and providing training takes most of the time allotted for filter distribution. Ecofiltro experimented with an incentive mechanism for NGOs/CBOs to collect end-user sales information, but due to the non-profit structure of the partner organizations they could not accept incentives or payments for collecting end-user information, and thus the incentive was discontinued. Ecofiltro has simplified the information requested in order get more end-user information and has provide NGOs/CBOs with additional guidance.

The DCD contains 8421 entries, which far exceed the Gold Standard minimum of 1000, or 10 times the minimum sample size which as described above is 100. The database includes types of distribution, with data from both direct sales as well as sales from NGO/CBOs. The database is

also representative of all regions of Guatemala, as 13 of the 22 departments are represented in the database. Ecofiltro will develop additional methods to collect end-user data and continue to solicit this information from its NGO/CBOs partners. To ensure that end users who received products through NGO/CBO networks were included in the monitoring exercise, as the sampling frame included sales from NGOs/CBOs even if no detailed customer information was collected. After the unsuccessful implementation of the NGO/CBO incentive mechanism mentioned above the PP realized the difficulty in capturing end user information and signed waivers through NGO/CBO programs. Thus, the PP, in line with communication with the GS during the GS 8-week Review, opted to apply carbon rights waiver stickers to the products in order to consistently and clearly communicate the carbon program to all participants. The PP has used similar stickers in other GS projects and believes the stickers clearly communicate carbon rights across the supply chain. Stickers enable everyone who has contact with the product to have access to information regarding carbon rights, including end-users. Thus, this method ensures ownership of carbon rights is transparent to all NGO/CBO and end users. Ecofiltro also explains the CRW and guarantee to suppliers at the time of purchase. Moving forward the PP will obtain a signed carbon rights waiver for all NGO/CBO partners included in the TSR and ensure that they understand that all benefits of emission reductions associated with project technologies belong to Stove Capital.

Please see [Annex 12 GS1321 Iss. 1 HH Filter Detailed Customer Database](#) for the Water Filter DCD.

STOVES

As discussed above, the Improved Stove Total Sales Record is inclusive of all customer details and no separate DCD is required. The combined TSR & DCD database includes the date of installation, end-user's name and contact information (when possible), stove serial number, and the geographic location (community and department). Additionally carbon rights waivers are signed by all end-users at the point of sale. Please see Section 6.a above for a detailed description of the TSR

7. FORWARD ACTIONS REQUESTS

TABLE 11 FORWARD ACTION REQUESTS

#	Issued When?	By Whom?	Description	Comment
FAR 1	Validation	GS	The verifying DOE is requested to check the sample copies of signed agreements for transfer of carbon credit rights at the time of first verification	Ecofiltro and SM are both using signed CRW waivers. Socorro Maya has received signed waivers from all end users, while Ecofiltro has received signed waivers from all direct sales in the Detailed Customer Database (5988). Ecofiltro has also added a CRW stickers to the boxes of technologies to ensure everyone along the distribution chain understands and acknowledges that carbon rights belong to the PP. Copies of CRW's are include in Annex 18 GS1321 Carbon Rights Waiver . Additionally

				<u>Ecofiltro has received signed Carbon Waivers from 19 NGOs/CBO representing 75% of total sales. Please see Annex 31 Ecofiltro NGO CRW</u>
FAR 2	Validation	GS	The 6 l/p/d is the cap allowed in the methodology. If water consumption test shows that actual water consumption is lower, then, the ERs to be claimed should be based on results of WCFT. The water consumption figure currently shown in the PDD (1.43 /lt/p/d) doesn't come from WCFT, but from the baseline surveys. This is not conclusive, the PP shall monitor the amount of water consumed for all hygienic purposes (washing hands, washing food, and drinking) as mentioned in the response. The project field test must be conducted and be ready before first the first verification and verifying DOE shall provide its opinion in this regard.	WCFTs were conducted by Green Development in January of 2014, and the estimations presented in the PDD have been replaced by the values measured during WCFTs. WCFTs were conducted by directly measuring water consumption, and also included qualitative questions to assess usage of filtered water for non-hygienic purposes or subsequent boiling of treated water. Monitoring determined that the quantity of treated water consumed for hygienic purposes is 3.29 l/p/d. Please see <u>Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report</u>
FAR 3	Validation	GS	The DOE is requested to assess the monitoring mechanism proposed by the PP to incentivize the replacement of baseline stoves at the time of first verification and provide their opinion in the verification report.	The PP has further incentivized the removal of traditional stoves by stipulating that the one year warranty is only valid if the end-user has removed and discontinued use of their traditional stove. The household stove monitoring was designed to account for dual stove usage, and the usage rate was adjusted to account for usage frequency of the baseline stove. Additionally, KPTs took a subsumed approach and accounted for fuel consumed on all stoves present in the household. Please see <u>Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report, Annex 4 GS1321 Iss. 1 KPT Report 2014 and Annex 18 GS1321 Carbon Rights Waiver</u>
FAR 4	Validation	GS	PP shall carry out another BWBT on time for the verification in order to crosscheck the fuel consumption values currently presented in the PDD. During the GS review, the GS requested the PP to revise the ERs calculation using the actual wood consumption without the evaporation factor.	To address the FAR, the PP ran an additional test with the same testing facility. However, the results from this second test differ so greatly from the first that the PP feels one or both must be anomalous. After discussion with the testing laboratory, the PP was unable to identify the reason for the difference in the results and has been unable to conduct additional tests to verify the results due to a lack of time and high costs associated with conducting the tests. Thus the PP with guidance from the GS to conduct field BWBT testing to account for all variables and obtain data that was representative of the baseline scenario (Annex 33). The PP conducted additional testing on households representative of the baseline scenario on June 2, 2014 to June 4, 2014. Results of the tests demonstrate

that 465.14g of wood is needed to boil 1 liter of water for 10 minutes using 3-stone fires. Thus the PP has revised the Wb,y value accordingly to 465.14g or (.00046514 tons). A full description of the results and protocol associated with these additional tests can be found in Annex 30 GS1321 Field BWBT Report V3. A full description justifying the use of this value can be found in the Section 5.e of this report.

8. LEAKAGE

Below is the leakage assessment for each potential source of leakage as defined in the GS TPDDTEC methodology and PDD :

- 1) *Source: The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.*

Assessment: No leakage.

Justification: There is no evidence that the project increases the use of higher emitting technologies outside the project boundary where lower emitting technologies are in place (i.e. 3 stones fires). Wood fuels remain a valuable and declining resource and this trend is not reversed by the project activity. The baseline technology used in Guatemala is three stone cook stoves, which are the same type of technology that is used outside the project boundary (Guatemala) i.e. Honduras, El Salvador, etc. Given that the leakage assessment does not expect an increase in fuel consumption by the non-project households/users attributable to the project activity, calculations do not need to be adjusted to account for this leakage.

- 2) *Source: The non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.*

Assessment: No leakage.

Justification: There is no evidence that the project increases in the use of higher emission fuel outside the project boundary where lower emitting energy sources take in place. Wood fuels remain a valuable and declining resource and this trend is not reversed by the project activity. Given that the leakage assessment does not expect an increase in fuel consumption by the non-project households/users attributable to the project activity, calculations do not need to be adjusted to account for this leakage.

- 3) *Source: The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario.*

Assessment: No leakage.

Justification: A list of CDM and VER project activities can be found in Annex 24 NRB Leakage Assessment, and of these projects, only two other projects account for NRB in their baseline scenario. The Project Proponent has determined that total number of people reached by all activities of GS1321 is less than 0.84% of the total Guatemalan population, and thus its effects to the national NRB value are negligible.

- 4) **Source:** *The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.*
Assessment: No leakage.
Justification: The stove monitoring survey, Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report, determined that 16% of stove users indicate that they use the Eko-stove to heat their home. However, all of these users indicate that they use the same amount of fuel for heating relative to the amount they used on their old stove. Thus it can be concluded that there are negligible changes in the amount of fuel used for heating after the introduction of the Eko-stove.
- 5) **Source:** *By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.*
Assessment: No leakage.
Justification: The stove monitoring survey, Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report shows that a small percentage (2%) of users have switched from using both firewood and LPG in the baseline to only using firewood after receiving the Eko-stove. Additionally 1% of households reported switching from using both firewood and biogas in the baseline to solely firewood after receiving the Eko-stove. All other respondents reported using fuelwood on a stove with lower efficiency than the Eko-stove. Since the percentage of respondents using technologies with lower emissions than the Eko-stove in the baseline (LPG and biogas stoves) is so small (<5%) and because these respondents combined the use of those technologies with higher emitting technologies (fuelwood stoves), leakage from fuel switching is considered negligible.

9. DATA & PARAMETERS

a. Data and Parameters Fixed Ex-ante (Not Monitored)

Data / Parameter:	EF_{b,wood,CO2}
Unit:	kg CO ₂ /TJ
Description:	The CO ₂ emission factor arising from use of fuels in baseline scenario
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	112,000
Purpose of data:	ER Calculations
Additional Comment:	Measuring emission factors from stove technologies is costly and difficult to do accurately. Lacking measurable emission factors from the baseline technologies, PP applies default IPCC emission values.

Data / Parameter:	EF_{b,wood,CH4}
Unit:	kg CH ₄ /TJ
Description:	The CH ₄ emission factor arising from use of fuels in baseline scenario

Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	300
Purpose of data:	ER Calculations
Additional Comment:	Measuring emission factors from stove technologies is costly and difficult to do accurately. Lacking measurable emission factors from the baseline technologies, PP applies default IPCC emission values.

Data / Parameter:	EF_{b,wood,N2O}
Unit:	tons N2O/TJ
Description:	The N2O emission factor arising from use of fuels in baseline scenario
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	4
Purpose of data:	ER Calculations
Additional Comment:	Measuring emission factors from stove technologies is costly and difficult to do accurately. Lacking measurable emission factors from the baseline technologies, PP applies default IPCC emission values.

Data / Parameter:	EF_{p,wood,CO2}
Unit:	kg CO2/TJ
Description:	The CO2 emission factor arising from use of fuels in project scenario
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	112,000
Purpose of data:	ER Calculations
Additional Comment:	Measuring emission factors from stove technologies is costly and difficult to do accurately. Lacking measurable emission factors from the project technologies, PP applies default IPCC emission values.

Data / Parameter:	EF_{p,wood,CH4}
Unit:	kg CH4/TJ
Description:	The CH4 emission factor arising from use of fuels in project scenario
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	300
Purpose of data:	ER Calculations
Additional Comment:	Measuring emission factors from stove technologies is costly and difficult to do accurately. Lacking measurable emission factors from the project technologies, PP applies default IPCC emission values.

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Data / Parameter:	EF_{p,wood,N2O}
Unit:	tons N2O/TJ
Description:	The N2O emission factor arising from use of fuels in project scenario
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied:	4
Purpose of data:	ER Calculations
Additional Comment:	Measuring emission factors from stove technologies is costly and difficult to do accurately. Lacking measurable emission factors from the project technologies, PP applies default IPCC emission values.

Data / Parameter:	NCV_{b.wood}
Unit:	TJ/ton
Description:	Net calorific value for fuel used in the baseline
Source of data:	IPCC default value. Reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
Value(s) applied:	0.0156/Gg = TJ/ton
Purpose of data:	ER Calculations
Additional Comment:	None

Data / Parameter:	NCV_{p.wood}
Unit:	TJ/ton
Description:	Net calorific value for fuel used in the project
Source of data:	IPCC default value. Reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
Value(s) applied:	0.0156/Gg = TJ/ton
Purpose of data:	ER Calculations
Additional Comment:	None

Data / Parameter:	W_{b,y}
Unit:	ton/litre

Description:	Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario during project year 2013, as per Baseline Water Boiling Test.
Source of data:	Annex 2 GS1321 2012 BWBT Report and Annex 3 GS1321 2012 BWBT Report Data
Value(s) applied:	.00046514
Purpose of data:	Calculation of baseline water emissions
Additional Comment:	As per FAR 4 and GS guidance, the PP has conducted additional field BWBTs to determine the quantity of fuel required to treat 1 litre of water using technologies representative of baseline stoves. Please see refer to the Baseline Water Boiling Test (BWBT) section of this report within the Overview of Monitoring Conducted in Iss.1 Monitoring Period section, for a more detailed explanation of the adjustment and the test conducted to determine the value. This value applies to water filters in Project Scenario 1 and 2, as without the intervention of the project the beneficiaries in Project Scenario 2 would be using the technologies represented in Project Scenario 2.

Data / Parameter:	$W_{p,unimproved\ stove,y}$
Unit:	ton/litre
Description:	Quantity of fuel in tons required to treat 1 litre of water using technologies representative of unimproved wood stoves during project year 2013, as per Baseline Water Boiling Test.
Source of data:	Annex 2 GS1321 2012 BWBT Report and Annex 3 GS1321 2012 BWBT Report Data
Value(s) applied:	.00046514
Purpose of data:	Calculation of baseline water emissions
Additional Comment:	As per FAR 4 and GS guidance, the PP has conducted additional field BWBTs to determine the quantity of fuel required to treat 1 litre of water using technologies representative of baseline stoves. Please see refer to the Baseline Water Boiling Test (BWBT) section of this report within the Overview of Monitoring Conducted in Iss.1 Monitoring Period section, for a more detailed explanation of the adjustment and the test conducted to determine the value. . Technologies found in the project scenario 1 were the same as those in the baseline scenario, thus no additional monitoring was needed to determine the $W_{p,y}$, please see Section 3.b of this report and Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report for a more detailed explanation of how water filter beneficiaries stoves reported in the project scenario are the same as the ones in the baseline scenario. This value applies to water filters in Project Scenario 1 and 2, as without the intervention of the project the beneficiaries in Project Scenario 2 would be using the technologies represented in Project Scenario 2

Data / Parameter:	C_i
Unit:	Percentage
Description:	Portion of users of project safe water supply who were already in baseline using a non-boiling safe water supply
Source of data:	Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report and Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data

Value(s) applied:	20.18%
Purpose of data:	Calculation of project water emissions
Additional Comment:	This value has been updated from 9.655% to 20.18% as project monitoring showed a higher penetration of appropriate water boiling technologies than demonstrated in the Baseline Study

b. Data and Parameters Monitored

I. Stoves (Project Scenario 2)

Data / Parameter:	N _{p,y,ics-nb}		
Unit:	technology-days		
Description:	Cumulative number of project technology-days included in the project database for project scenario p for technology ics-nb against baseline scenario b in year y		
Measured/Calculated /Default:	Calculated		
Source of data:	TSR		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	N _{p,y,ics-nb}	191,195	Annex 1 GS1321 ER Calculations
			Annex 10 GS1321 Iss. 1 Stoves - Total Sales Record
Monitoring Equipment:	n/a		
Measuring/Reading/Recording frequency:	Sales information is recorded continuously through the TSR. The TSR includes the quantity of technologies sold and the date of sale, from which the number of technology days can be calculated		
Calculation method (if applicable)	The project calculates the number of days each technology has been in operation by using the date of sale date recorded in the TSR. The value is calculated by the summation of technology days of each sale.		
QAQC Procedures:	Sales data collection is transparent and verifiable. The Paradigm Project cross checks a sample of the hard copies of sales invoices to ensure data is properly entered into the sales database		
Purpose of data:	Calculation of project stove emissions		
Additional Comment:	The PP has revised the units of this parameter from project technologies credited (units) specified in the parameter box in the PDD and methodology to technology-days specified in the equations in the PDD and methodology, to be in line with definition of the parameter in the ER equation.		

Data / Parameter:	P _{p,b,y,ics-nb}		
Unit:	tons/technology-day		
Description:	Specific fuel savings for an individual technology of project scenario 2 against an individual technology of baseline scenario in year 2013-2014, in tons/technology-day, as derived from the statistical analysis of the data collected from the field tests		
Measured/Calculated /Default:	Measured/Calculated		
Source of data:	Paired KPT, Monitoring Survey (MS)		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	P _{p,b,y,ics-nb}	0.014	Annex 4 GS1321 Iss. 1 KPT Report
			Annex 5 GS1321 Iss. 1 KPT Data
			Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report
			Annex 9 GS1321 Iss. 1 Stoves - 2014 KS & US Data
			Annex 1 GS1321 ER Calculations V5
Monitoring Equipment:	Enumeration teams were equipped with scales and wood moisture meters in order to take precise fuel measurements.		
Measuring/Reading/Recording frequency:	Biennial Performance Tests, Annual Monitoring Surveys		
Calculation method (if applicable)	Calculated by multiplying the fuel savings per meal from the paired KPT, 0.0009tons/person meal/day by the number of person meals per day from the MS, 16.98 meals.		
QAQC Procedures:	Monitoring was conducted by a 3 rd party and data was cross checked to ensure accuracy. Details can be found in the reports noted in the supporting documents.		
Purpose of data:	Calculation of project stove emissions savings		
Additional Comments:	Paired KPTs provide per meal fuelwood savings of .0009tons/person meal/day that are then multiplied by the number of person meals reported in the MS. 16.89 meals per day. This parameter was not included in the parameter section of the methodology and the PDD, but was included in the ER equations of both. Thus the PP has included the parameter in the monitoring report, in line with the information noted in the PDD under P_{p,b,y} and P_{p,y}. P_{p,b,y,ics-nb} is the Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y. Thus in essence it is the same as the difference in the specific fuel consumption for an individual technology in baseline scenario b (P_{b,y}) and the specific fuel consumption for an individual technology in project scenario p (P_{p,y}). Since as by definition P_{p,b,y} is the difference between P_{p,y} and P_{b,y} the PP has adopted the similar parameter descriptions for P_{p,b,y} as the ones for P_{p,y} and P_{b,y} noted in the PDD. The parameter is in tons/technology-day as per the definition in the methodology		

	The PP has revised the units of this parameter from kg/household-day specified in the parameter box in the PDD and methodology to tons/day for an individual technology specified in the equations in the PDD and methodology, to be in line with definition of the parameter in the ER equation.
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Data / Parameter:	$U_{p,y,ics-nb}$		
Unit:	Percent		
Description:	Usage rate in project scenario 2, for technology improved cookstove, during year 2013		
Measured/Calculated /Default:	Measured		
Source of data:	Usage Survey (US)		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	$U_{p,y,ics-nb}$	92.39%	Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report Annex 9 GS1321 Iss. 1 Stoves - 2014 KS & US Data
Monitoring Equipment:	Survey		
Measuring/Reading/Recording frequency:	Annual before the time of issuance		
Calculation method (if applicable)	Calculated using a binary usage rate which was then adjusted for continued use of the baseline stove		
QAQC Procedures:	Monitoring was conducted by Green Development, a 3 rd party, who also cross checked data to ensure accuracy. Details can be found in Annex 8 GS1321 Iss. 1 Stoves – 2014 KS & US.		
Purpose of data:	Calculation of project stove emissions		
Additional Comments:	The usage rate accounts for non-usage of the Eko-stove as well as continued use of baseline stoves, and usage frequency, per GS guidelines for monitoring and calculating usage		

Data / Parameter:	$LE_{p,y,ics-nb}$
Unit:	tCO ₂ e/yr

Description:	Leakage in project scenario 2 during year 2013		
Measured/Calculated /Default:	Calculated/measured		
Source of data:	Baseline and monitoring surveys		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	LE _{p,y,ics-nb} :	0.00	Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report Annex 24 NRB Leakage Assessment
Monitoring Equipment:	Survey and Desk Review		
Measuring/Reading/Recording frequency:	Biennial		
Calculation method (if applicable)	All leakage sources noted in the PDD were determined to be negligible		
QAQC Procedures:	Monitoring was conducted by a 3 rd party and data was cross checked to ensure accuracy. Details can be found in the reports noted in the supporting documents.		
Purpose of data:	Calculation of project stove emissions		
Additional Comments:			

Data / Parameter:	f_{NRB,y,ics-nb}
Unit:	Fraction
Description:	Non-renewability status of woody biomass fuel in scenario i during year y
Measured/Calculated /Default:	Calculated using applicable NRB analysis from literature
Source of data to be used:	NRB assessment
Value(s) of monitored parameter:	0.9574
Monitoring Equipment:	n/a
Measuring/Reading/Recording frequency:	Fixed by baseline study for a given crediting period, updated if necessary as specified in Methodology section III.1.
Calculation method (if applicable)	n/a

QAQC Procedures:	n/a
Additional Comments:	fNRB analysis was reviewed internally by Impact Carbon who determined that there have been no recent publications which would justify changing the assessment validated in the PDD

II. Water Treatment technologies (Project Scenario 1 & 2):

Data / Parameter:	N _{p,y,wt}		
Unit:	person-days		
Description:	<u>WT</u> : Number of person-days consuming water supplied by project scenario p through year y		
Measured/Calculated /Default:	Measured/Calculated		
Source of data:	Monitoring Survey (MS)		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	N _{p,y,wt}	24,833,125	Annex 1 GS1321 ER Calculations
			Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
Monitoring Equipment:	Survey		
Measuring/Reading/Recording frequency:	MS data is collected on an annual basis to determine persons per technology and sales data is collected continuously to calculate person-days		
Calculation method (if applicable)	The number of days each technology has been in operation is calculated from the date of sale in the TSR. The date of sale of each technology has been adjusted by an inventory lag factor of 9.95 days to conservatively account for the time in inventory before filters reached the end user. The cumulative number of technology days is calculated by the summation of the number of days in operation of each individual technology minus the inventory lag adjustment factor. The number of technology days is then multiplied by the number of persons drinking per filter reported in the Monitoring Survey (MS), to calculate the number of person-days. (4479952.4 technology days x 5.6929825 people per filter = 25,504,291 person days) N_{py,wt} was also reduced by 2.63% to account for households who used LPG stoves and boiled water in the baseline, as these households are not eligible for crediting. Please refer to Section 5.c of this report and Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report, Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data for a more detailed explanation		
QAQC Procedures:	Sales data collection is transparent and verifiable. The Paradigm Project cross checks a sample of the hard copies of sales invoices to ensure data is properly entered into the sales database. Monitoring was conducted by Green		

	Development, a 3 rd party, who also cross checked the data to ensure accuracy. Details can be found in Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
Purpose of data:	Calculation of project water emissions
Additional Comment:	

Data / Parameter:	U _{p,y,wt}		
Unit:	Percent		
Description:	Usage rate in project scenario 1 and 2, for technology water filters, during year 2013		
Measured/Calculated /Default:	Measured		
Source of data:	Usage Survey (US)		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	U _{p,wt} :	97.44%	Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
			Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data
Monitoring Equipment:	Survey		
Measuring/Reading/Recording frequency:	Annual, before the time of issuance		
Calculation method (if applicable)	Calculated using the percent of respondents that meet all criteria in the “Guidelines for carrying out usage survey for projects implementing household water filtration technologies”		
QAQC Procedures:	Monitoring was conducted by Green Development, a 3 rd party, who also cross checked data to ensure accuracy. Details can be found in the reports noted in Annex 6 GS1321 Iss. 1 HH WCFT MS & US.		
Purpose of data:	Calculation of project water emissions		
Additional Comments:	Monitoring was conducted prior to the publication of “Guidelines for carrying out usage survey for project implementing household water filtration technologies”, but the PP took a conservative approach and only classified filters as in use if they met all the requirements in the Guidance		

Data / Parameter:	Q _{p,y}		
Unit:	Litres per person per day (L/p/d)		
Description:	Total amount of raw water treated with the ‘zero or low emissions’ water treatment technology for household drinking water, hand washing and food washing in the project scenario 1 and 2, during year 2013		
Measured/Calculated /Default:	Measured		
Source of data:	Water Consumption Field Test (WCFT)		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	Q _{p, y} :	3.29	Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
			Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data
Monitoring Equipment:	Survey, standard 5 gallon graduated buckets, standard sized pitchers		
Measuring/Reading/Recording frequency:	Biennial		
Calculation method (if applicable)	Average water consumption for hygienic purposes per household monitored		
QAQC Procedures:	Monitoring was conducted by a 3 rd party and data was cross checked to ensure accuracy. Details can be found in the reports noted in the supporting documents.		
Purpose of data:	Calculation of project water emissions		
Additional Comments:			

Data / Parameter:	$Q_{p,cleanboil,y}$		
Unit:	Litres per person per day (L/p/d)		
Description:	Quantity of treated water still boiled in the project scenario 1 and 2, after installation of project technology		
Measured/Calculated /Default:	Measured		
Source of data:	Water Consumption Field Test (WCFT)		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	$Q_{p,cleanboil,y}$:	0.19	Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report

			Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data
Monitoring Equipment:	Survey, standard 5 gallon graduated buckets, standard sized pitchers		
Measuring/Reading/Recording frequency:	Biennial		
Calculation method (if applicable)	Average of participant reported quantity of filtered water boiled per day		
QAQC Procedures:	Monitoring was conducted by a 3 rd party and data was cross checked to ensure accuracy. Details can be found in the reports noted in the supporting documents.		
Purpose of data:	Calculation of project water emissions		
Additional Comments:			

Data / Parameter:	$LE_{p,y,wt}$		
Unit:	tCO ₂ e/yr		
Description:	Leakage in project scenario 1 and 2 during year 2013		
Measured/Calculated /Default:	Calculated/measured		
Source of data:	Baseline and monitoring surveys		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	$LE_{p,y,wt}$	0.00	Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report Annex 24 NRB Leakage Assessment
Monitoring Equipment:	Survey and Desk Review		
Measuring/Reading/Recording frequency:	Biennial		
Calculation method (if applicable)	All leakage sources noted in the PDD were determined to be negligible		
QAQC Procedures:	Monitoring was conducted by a 3 rd party and data was cross checked to ensure accuracy. Details can be found in the reports noted in the supporting documents.		
Purpose of data:	Calculation of water project emissions		
Additional Comments:			

Data / Parameter:	Water Quality		
Unit:	Percent		
Description:	Performance of the treatment technology		
Measured/Calculated /Default:	Measured using a proxy		
Source of data:	Monitoring Surveys (MS) and Laboratory Reports		
Value(s) of monitored parameter:	<u>Project Scenario</u>	<u>Value</u>	<u>Supporting Documentation</u>
	Water Quality	100%	Annex 15 Iss 1. GS 1321 Ecofiltro Water Quality Tests Annex 6 GS1321 Iss 1 HH WCFT MS US Report
Monitoring Equipment:	Survey and Laboratory Tests		
Measuring/Reading/Recording frequency:	Annual		
Calculation method (if applicable)	The effectiveness of project technologies may be indicated reliably through proxies, such as reliable evidence that they are being maintained and used correctly in accordance with manufacturers' or installers', then the FTs may capture such evidence of water quality in place of chemical and biological indicator tests. Laboratory tests and manufacturers specifications indicate that the technology has a lifespan of at least 2 years, thus all technologies distributed in this monitoring period have not reached their lifespan. Monitoring Surveys captured information to ensure that all end users were using the technology as per the manufacturer's recommendations.		
QAQC Procedures:	Monitoring was conducted by a 3 rd party and data was cross checked to ensure accuracy. Manufacturer's specifications were verified by lab tests conducted on filters by 3 rd party laboratories. Details can be found in the reports noted in the supporting documents.		
Purpose of data:	Calculation of water project emissions		
Additional Comments:			

8. SUSTAINABLE DEVELOPMENT IMPACT

a. Local Business and Economic Development, Capacity Building

This project provides many ancillary benefits in Guatemala, such as supporting the local economy and creating jobs. Locally, the project provides employment for significant numbers of workers, office staff and field marketers, and continues to do so as companies grow, production relationships develop and new markets become available.

b. Employment

The project directly and indirectly supports employment for partner organizations, local enterprises and distribution entrepreneurs:

- ☐ Ecofiltro operations support a team of 43 full-time employees
- ☐ Ecofiltro also distributes filters to 67 NGOs/CBOs, indirectly helping to create additional employment opportunities
- ☐ Socorro Maya directly employs 13 full time staff
- ☐ Additionally, the project has supported the employment of enumerators and local monitoring and evaluation specialists as part of fulfilling the project's monitoring requirements.

c. Market Development and Capacity Building

To support partner project sales nationwide, the project is focused on various market development and capacity building initiatives:

- ☐ Socorro Maya works with local banks to provide loans to make stoves more affordable. Providing these loans allows beneficiaries access to capital as well as the opportunity to build credit.
- ☐ Ecofiltro provides some beneficiaries with a payment plan where they receive the filter for free then make monthly instalments so they can purchase a replacement filter
- ☐ Both Socorro Maya and Ecofiltro provide training and capacity building opportunities to beneficiaries and community leaders to ensure the success of the project.

d. Sustainable Development Indicator Monitoring

Sustainable Development Indicators (SDI) are monitored in accordance with the parameters selected for monitoring in the GS1321 Gold Standard Passport. Table 12 presents a summary of the SDI monitoring results from each of the project scenario's MS data.

TABLE 12 SUMMARY OF SUSTAINABLE DEVELOPMENT MONITORING RESULTS

Indicator	Monitoring Source	Variables, Units and Frequency of Measurements	Monitored Result	
			Stoves (Project Scenario 2)	Water Filters (Project Scenario 1&2)

Air quality	Monitoring Survey Stoves (Project Scenario 1) : Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report	Measurement of user perceptions between old stove and new stove: smoke levels, incidence of coughing, incidence of respiratory illness, and incidence of itchy eyes	Monitoring survey reveals that 98.1% of project household stove users report that less eye irritation, smoke, and coughing, while 1.9% did not know how this parameter had changed. All respondents reported that the frequency of respiratory illness either remained the same or decreased after receiving the eko-stove. Please see the Sustainability Indicators section of Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report for additional details.	N/A
Water quality and quantity	Monitoring Survey Water Filters (Project Scenario 1 & 2) Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report	Measurement of user perceptions of filtered water compared to boiled or untreated water and incidence of diarrhea	N/A	97% of households reported the have better access to safe water since receiving the filter. 96% of households reported that the water has a better taste than water they were drinking before. 87% of respondents also reported a reduction in stomach illnesses since using the filter. For additional details please refer to Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
Livelihood of the poor	Monitoring Survey Stoves and Water Filters <u>Stoves (Project Scenario 2):</u> Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report <u>Water Filters (Project Scenario 1 & 2)</u> Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report	Time and/or money savings due to reduced fuel consumption	The Monitoring Survey shows that the majority 96% of respondents purchase fuel. For those who purchase fuel an average savings of 152.64Q (about 20 USD) a month was reported. For those who collect fuel an average monthly time savings of 2.47 hours was reported. Please see the Sustainability Indicators section of Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report for additional details.	The Monitoring Survey shows 77% collect fuelwood and 17% purchase fuel (6% of the population responded that the collect and purchase fuel). Respondents who purchase fuel reported an average monthly savings of 21.54 (~2.77USD)—roughly 14% of what they were previously spending. Respondents who collect fuelwood reported less time used for collected fuelwood since adopting the filter—average they save 3.81 hours per month, which is a 40% time savings. Additionally 73% of respondents report that they spend less time boiling water and collecting fuel since receiving the filter. For additional details please refer to Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
Access to affordable and clean energy services:	Monitoring Survey Stoves and Water Filters. <u>Stoves (Project Scenario 2):</u> Annex 8 GS1321 Iss. 1 Stoves -	Time and/or money savings due to reduced fuel, change in fuel consumption, and change in traditional fuel consumption.	As mentioned under Sustainable Development Indicator Livelihood of the Poor, project beneficiaries are spending less time and money on fuel saving 152.54Q or 2.47 hours. Thus demonstrating a reduction in fuel consumption. Additionally the KPT indicates that households reduce fuel consumption by 78% per person meal. Thus the energy required by beneficiaries is	As mentioned under Sustainable Development Indicator Livelihood of the Poor mentioned above, project beneficiaries are spending less time and money spent obtaining fuelwood, which is a result of decreased fuel consumption. Prior to receiving the filter 79.82% of beneficiaries boiled their water for purification purposes. Since receiving the filter, 99% of the population uses their filter all the time,

	2014 KS & US Report And Annex 4 GS1321 Iss. 1 KPT Report <u>Water Filters (Project Scenario 1 & 2) Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report</u>		less than in the baseline and project beneficiaries reduce their consumption of traditional fuels. Please refer to Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report and Annex 4 GS1321 Iss. 1 KPT Report	and only 4% of the water consumed during the WCFT was subsequently boiled. Thus, monitoring demonstrates that beneficiaries discontinued their use of traditional fuels in favor of treating water with the Ecofiltro, lowering fuel consumption and changing the use of traditional fuel to the use of an Ecofiltro. For additional details please refer to Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report
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10. EMISSIONS REDUCTIONS

a. Equations & Calculations

The emission reductions equations used for this monitoring period are as follows.

PROJECT SCENARIO 2 IMPROVED COOKSTOVES

$$ER_{y, hh-dual, ics-nb} = \sum_{b,p} (N_{p,y,ics-nb} * U_{p,y,ics-nb} * P_{p,b,y,ics-nb} * NCV_{b,fuel} * ((f_{NRB,b,y,ics-nb} * EF_{fuel,CO2}) + EF_{fuel,nonCO2}) - \sum LE_{p,i,y,ics-nb})^7$$

Where:

TABLE 13 PROJECT SCENARIO 2 STOVE EMISSION REDUCTION PARAMETERS

Parameter	Value	Unit	Definition
$f_{nrb,y,ics-nb}$	96%	Percentage	Non-renewable fraction of the woody biomass harvested in the project collection area in year y
$P_{p,b,y,ics-nb}$	0.014	tons/technology-day	Specific fuel savings for an individual technology of project scenario 2 against an individual technology of baseline scenario in year 2013, in tons/technology-day, as derived from the statistical analysis of the data collected from the field tests
$U_{p,y,ics-nb}$	92.39%	percentage	Usage rate in project scenario p, for technology ics-nb, during year y

⁷ Note to convert $EF_{fuel,nonCO2}$ to CO_2 equivalents the following formula is used: $F_{fuel,nonCO2} = (EF_{wood,CH4} * GWP_{CH4}) + (EF_{wood,N2O} * GWP_{N2O})$

NCV _{Wood}	0.0156	TJ/ton	Net calorific value of wood (TJ/Gg)
EF _{b,wood,CO2}	112,000	kg CO2/TJ	IPCC default value for wood fuel CO2 emission factor
EF _{b,wood,CH4}	300	kg CH4/TJ	CH4 emission for wood fuel
EF _{b,wood,N2O}	4	kg N2O/TJ	N2O emission factor for wood fuel
GWP _{CO2}	1	kg CO2/kg CO2	Global warming potential of CO2
GWP _{CH4}	25	kg CO2/kg CH4	Global warming potential of CH4
GWP _{N2O}	298	kg CO2/kg N2O	Global warming potential of N2O
N _{py,ics-nb}	191,195	technology-days	Cumulative number of project technology-days included in the project database for project scenario p for technology ics-nb against baseline scenario b in year y
LE _{p,y,ics-nb}	0	tCO2e/yr	Leakage for project scenario p, technology ics-nb, in year y (tCO2e/yr)

PROJECT SCENARIO 1 AND 2 WATER FILTER

Emission Reductions calculations are the same for all filters regardless if they were distributed along with a project stove.

Baseline Scenario Fuel Consumption Calculation

$$B_{b,y,wt} = (1 - C_j) * N_{p,y,wt} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y}) \quad (1)$$

The PP eliminated $Q_{p,rawboil,y}$ from the equation as per the guidance in GS June 2012 TAC update which allows the PP to not monitor the raw water boiled in the project situation and apply a cap of 6 l/p/d is applied on the amount of water treated by the water treatment technology for drinking water, hand washing and food washing.

Where:

TABLE 14 PROJECT SCENARIO 1 & 2 FILTER BASELINE EMISSION REDUCTION PARAMETERS

Parameter	Value	Unit	Definition
C _j	20.18%	percentage	Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it

$N_{p,y,wt}$	24,833,125	persons/day/technology	Number of personconsuming water supplied by project scenario per technology per day
$W_{b,y,unimproved}$	0.00046514	tons wood / liter	Existing biomass stove performance in baseline for water treatment unit l in year y in cluster c
$Q_{p,y}$	3.29	Litres / person / day	Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day.
$Q_{p,rawboil,y}$	NA	liters / person / day	~~Quantity of raw water still boiled in the project scenario p~~

Project Scenario Fuel Consumption Calculation

$$B_{p,y,wt} = (1 - C_j) * N_{p,y,wt} * W_{p,y} * (Q_{p,rawboil,y} - Q_{p,cleanboil,y}) \quad (2)$$

Where:

Parameter	Value	Unit	Definition
C_j	20.18%	percentage	Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it
$N_{p,y,wt}$	24,833,125	persons/day/technology	Number of persons consuming water supplied by project scenario per technology per day
$W_{p,y,unimproved}$	0.0006514	Tons / liter	Existing biomass stove performance in project for water treatment unit l in year y in cluster c

$Q_{p,y}$	3.29	Litres / person / day	Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day.
$Q_{p, \text{cleanboil}, y}$	0.188	litres / person / day	Quantity of treated water still boiled in the project scenario p

Emission Reductions

$$BE_{b,y,wt} = B_{b,y,wt} * ((f_{NRB,b,y,wt} * EF_{b,fuel, CO2}) + EF_{b,fuel, nonCO2}) * NCV_{b, fuel} \text{ (3)}^8$$

$$PE_{p,y,wt} = B_{p,y,wt} * ((f_{NRB,p,y,wt} * EF_{p,fuel, CO2}) + EF_{p,fuel, nonCO2}) * NCV_{p, fuel} \text{ (4)}^9$$

Where:

TABLE 15 PROJECT SCENARIO 1 & 2 FILTER PROJECT EMISSION REDUCTION PARAMETERS

Parameter	Value	Unit	Definition
$B_{b,y,wt}$	30,346.98	Tons	Quantity of fuel consumed in baseline scenario b during the year y in tons
$B_{p,y,wt}$	1,734.43	Tons	Quantity of fuel consumed in project scenario p during the year y in tons
$f_{NRB,b,y,wt}$	95.74%	percentage	Non-renewable fraction of the woody biomass harvested in the project collection area in year y in the baseline scenario
$EF_{b,wood,CO2}$	112,000	kg CO2/TJ	IPCC default value for wood fuel CO2 emission factor

⁸ Note to convert $EF_{b,fuel,nonCO2}$ to CO₂ equivalents the following formula is used: $EF_{b,fuel,nonCO2} = (EF_{b,wood,CH4} * GWP_{CH4}) + (EF_{b,wood,N2O} * GWP_{N2O})$

⁹ Note to convert $EF_{p,fuel,nonCO2}$ to CO₂ equivalents the following formula is used: $EF_{p,fuel,nonCO2} = (EF_{p,wood,CH4} * GWP_{CH4}) + (EF_{p,wood,N2O} * GWP_{N2O})$

EF _{b,wood,CH4}	300	kg CH4/TJ	CH4 emission for wood fuel
EF _{b,wood,N2O}	4	kg N2O/TJ	N2O emission factor for wood fuel
EF _{p,wood,CO2}	112,000	kg CO2/TJ	IPCC default value for wood fuel CO2 emission factor
EF _{p,wood,CH4}	300	kg CH4/TJ	CH4 emission for wood fuel
EF _{p,wood,N2O}	4	kg N2O/TJ	N2O emission factor for wood fuel
NCV _{Wood}	0.0156	TJ / ton	Net calorific value of wood
GWP _{CO2}	1		Global warming potential of CO2
GWP _{CH4}	25		Global warming potential of CH4
GWP _{N2O}	298		Global warming potential of N2O

The overall GHG reductions are calculated as follows:

$$ER_{y,hh-wt} = (\sum BE_{b,y,wt} - \sum PE_{p,y,wt}) * U_{p,y,wt} - \sum LE_{p,y,wt} \quad (5)$$

Where:

BE_{b,y,wt} and PE_{p,y,wt} are calculated from the parameters above and:

TABLE 16 PROJECT SCENARIO 1 & 2 FILTER USAGE EMISSION REDUCTION PARAMETER

Parameter	Value	Unit	Definition
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$U_{p,y,wt}$	97.44%	percentage	Usage rate in project scenario p, for technology wt, during year y
$LE_{p,y,wt}$	0	tCO ₂ e/yr	Leakage for project scenario p, technology wt, in year y (tCO ₂ e/yr)

Annex 1. GS1321 ER Calculations contains all Emissions Reductions (ER) calculations for each of the technologies described in this report. There are two tabs for each technology:

1. Technology ER Eqs.
 - a. Provides calculation of the ERs based equations listed above and project monitoring conducted to date and default values (as listed in the Parameter boxes in this report)
 - b. Follows ER equations as listed in the TPDDEC Methodology
2. Technology ER Calcs.
 - a. Technology days accrued during this monitoring period are calculated using total sales database.
 - b. Stock turnover rate or inventory lag days are accounted for (where applicable), but the calculation of an inventory lag date (sales date + inventory lag days) which is used to determine the technology years accrued during this MP. Please see **Annex 13. GS1321 Iss. 1 Filter Inventory Lag Analysis Data** for the analysis used to determine the number of inventory lag days applied to each technology.

c. Total ERs for this Monitoring Period

Table 17 shows the total CO₂e emissions reductions achieved by the Project during the Issuance 1 Monitoring Period (01 Jan 2013 – 31 Mar 2014). Table 18 shows CO₂e emissions reductions for the 2013 vintage and 2014 vintage during Issuance 1 Monitoring Period (01 Jan 2013 – 31 Mar 2014)

TABLE 17 TOTAL EMISSIONS REDUCTIONS FOR ISSUANCE 1 MONITORING PERIOD

Project Technology	Emissions Reductions (tCO ₂ e)
Stoves	4,431
Water Filters	50,415
Total Emissions Reductions	54,847

TABLE 18 TOTAL EMISSION REDUCTIONS FOR ISSUANCE 1 MONITORING PERIOD BY VINTAGE

Project Technology	Emissions Reductions (tCO ₂ e) Vintage 2013	Emissions Reductions (tCO ₂ e) Vintage 2014	Emissions Reductions (tCO ₂ e) Vintage Total
Stoves	2,620	1,812	4,431
Water Filters	32,702	17,714	50,415
Total	35,321	19,525	54,847

LIST OF SUPPORTING ANNEXES

- ☐ Annex 1 GS1321 ER Calculations V5
- ☐ Annex 2 GS1321 2012 Laboratory BWBT Report
- ☐ Annex 3 GS1321 2012 Laboratory BWBT Report Data
- ☐ Annex 4 GS1321 Iss. 1 KPT Report V2
- ☐ Annex 5 GS1321 Iss. 1 KPT Data V3
- ☐ Annex 6 GS1321 Iss. 1 HH WCFT MS & US Report V4
- ☐ Annex 7 GS1321 Iss. 1 HH WCFT MS & US Data V4
- ☐ Annex 8 GS1321 Iss. 1 Stoves - 2014 KS & US Report V2
- ☐ Annex 9 GS1321 Iss. 1 Stoves - 2014 KS & US Data V2
- ☐ Annex 10 GS1321 Iss. 1 Stoves - Total Sales Record V3
- ☐ Annex 11 GS1321 Iss. 1 HH Filter - Total Sales Record V3
- ☐ Annex 12 GS1321 Iss. 1 HH Filter Detailed Customer Database V3
- ☐ Annex 13 GS1321 Iss. 1 Filter Inventory Lag Analysis Data
- ☐ Annex 14 GS1321 Iss. 1 Water Quality Report
- ☐ Annex 15 GS1321 Iss. 1 Ecofiltro Water Quality Test
- ☐ Annex 16 GS1321 Iss. 1 Statistician Sampling Plan V2
- ☐ Annex 17 Chris Sullivan CV
- ☐ Annex 18 GS1321 Carbon Rights Waiver

- ☐ Annex 19 Gold Standard Usage Clarification
- ☐ Annex 20 GS 1321 PDD
- ☐ Annex 21 GS 1321 Validation 8-Week Review
- ☐ Annex 22 GS 1321 Passport
- ☐ Annex 23 Ecofiltro and Socorro Maya Employee List
- ☐ Annex 24 NRB Leakage Assessment
- ☐ Annex 25 Ecofiltro_Operations_Manual
- ☐ Annex 26 Socorro Maya_Operations_Manual
- ☐ Annex 27 Green Development Training Attendance
- ☐ Annex 28 Water Filter Monitoring
- ☐ Annex 29 Stove Filter Monitoring
- ☐ Annex 30 GS 1321 Field BWBT Report
- ☐ Annex 31 Ecofiltro NGO CRW
- ☐ Annex 32 Chris Sullivan Contract
- ☐ Annex 32 Zamorano contract
- ☐ Annex 32 Roger Perez Correspondence
- ☐ Annex 33 BWBT Correspondence with GS
- ☐ Annex 33 Confirmation of BWBT protocol
- ☐ Annex 34 Ecofiltro ONE 990
- ☐ Annex 35 Ecofiltro Manufacturers Specifications
- ☐ Annex 35 Eko-stove Manufacturers Specifications