



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006**

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SECTION A. General description of project activity.

A.1. Title of the project activity:

Sustainable Deployment of the LifeStraw® Family in rural Kenya, Version 9.0, January 2011.

A.2. Description of the project activity:

Objective of the Project Activity

Vestergaard S.A. seeks to distribute over one million LifeStraw® Family units, serving over four million people, in rural Kenya. These units will treat contaminated drinking water, and reduce the demand for conventional water treatment through boiling water with non-renewable biomass. With the assistance of carbon finance, this project can be economically sustainable and provide a significant improvement in public health.

Proposed Activity

Vestergaard S.A. (VF) is a European-based international company specializing in complex emergency response and disease control products. The LifeStraw® Family and LifeStraw® are complementary point-of-use water filters that help people access safe drinking water at home and outside. LifeStraw® Family is an instant microbiological purifier that delivers at least 18,000 liters of EPA-quality drinking water.

VF seeks to distribute over one million LifeStraw® Family units in rural Kenya, serving over 4 million people. This effort will be part of an Integrated Prevention Campaign (IPC) that allows leveraging of other resources to simultaneously distribute several life-saving technologies. However, without the benefit of carbon finance, the LifeStraw® Family unit will not be part of the IPC.

Contribution to Sustainable Development and the Millennium Development Goals

Over a billion people in the world lack access to safe drinking water. Water-borne disease is a leading cause of illness in the developing world, contributing to the death of two million children every year, on average. While numerous technological, medical, and educational solutions have been implemented for the benefit of disadvantaged communities, there is no ‘magic bullet.’ Instead, development agencies must partner directly with these communities to address their public health needs through appropriate technology solutions, backed up by education and assessment.

The LifeStraw® Family is a point-of-use microbial water treatment system intended for routine use in low-income settings. The system can filter up to 18,000 liters of water, enough to supply a family of five with microbiologically clean drinking water for three years, thus removing the need for repeat intervention. The system requires no electricity or additional consumables beyond the unit itself. LifeStraw® Family complies with the US Environmental Protection Agency’s “Guide Standard and Protocol for Testing Microbiological Water Purifiers,” providing treated water that is as-good or better than boiling for microbiological contamination. The LifeStraw® Family reduces the use and demand for firewood for water treatment by boiling. This directly leads to reduced CO2 emissions.

This project directly addresses several of the United Nations Millennium Development Goals (MDGs), including halve, by 2015, the proportion of the population without sustainable access to safe drinking



water and basic sanitation; integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources; reducing child mortality, improving maternal health, combating disease, ensuring environmental sustainability, and developing a global partnership for development.

This new model for hydrophilanthropy is unique in the humanitarian development field. Traditional development organizations rely on government, United Nations (UN), or charity grants, and have finite funding with specific goals for discrete projects. Even foundations with sustainable endowments fund projects individually, often with little commitment for sustaining the projects one year, or ten years, later.

Instead, under this model, economic sustainability and expansion are generated only by the continued use of the distributed LifeStraw® Family. There is a direct incentive to ensure that the projects are successful, in that these same projects serve to fund further development. No longer is there a disconnect between funding and public health outcomes.

The Republic of Kenya's Division of Water Safety of the Department of Environment and Sanitation in the Ministry of Public Health and Sanitation (MOPHS) is charged with protecting consumers by ensuring water safety. The Strategic Plan seeks to increase the number of households accessing safe and treated water by 25%. These targets are integrated in the Integrated Prevention Campaign (IPC) program through the distribution of LifeStraw® Family point-of-use water treatment. The IPC will provide a CarePack to over one million people in western Kenya consisting of the LifeStraw® Family water purification tool, a PermaNet® long-lasting insecticide-treated bednet, condoms and educational materials as encouragement for residents to participate in a voluntary HIV counselling and testing campaign.

By combining carbon finance with the deployment of water treatment systems, this project will directly combine sustainable humanitarian development with international carbon markets. This will contribute to a nascent field wherein humanitarian goals are met in an economically sustainable and accountable way, rather than simply through unsustainable charity and aid. Through distributing LifeStraw® Family water treatment systems to over one million people, this project has the potential to dramatically reduce incidence of waterborne disease for more than four million people and reduce the use of firewood.

This project will provide access to clean drinking water to over four million rural Kenyans. The socioeconomic benefits of access to clean drinking water are well documented, and include reduced time spent provisioning water, reduced cost for families, reduced child and adult morbidity and mortality, improved attendance at school, increased productivity, and generally a sense of hope and opportunity.

This project will directly employ several thousand Kenyans during the deployment, and several hundred during annual monitoring, education and maintenance activities. The distribution of LifeStraw® Family also represents a direct investment in the public health and future of Kenya.

Vestergaard S.A. is the project proponent for this activity, and has established consulting relationships to develop the program. Manna Energy Limited, a social enterprise dedicated to combining the carbon credit market with humanitarian technologies, was contracted to develop the carbon finance program for the LifeStraw® Family. EXP Agency, a social mobilization firm with strong Kenyan presence was contracted to conduct surveys and stakeholder consultations. The Kenyan DNA, the National Environmental Management Agency (NEMA) was consulted during project development.

**A.3. Project participants:**

Name of Party involved (host) indicates a host party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Kenya (Host)	Vestergaard S.A. (private entity)	No

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:**

The project is located in 19 districts throughout the Western Province of the Republic of Kenya. Please note that the Government of Kenya is currently re-zoning the Western Province to include an expected 23 total districts. However, during the planning stage of this project there were 19 districts, and all distribution sites are marked by GPS coordinates, regardless.

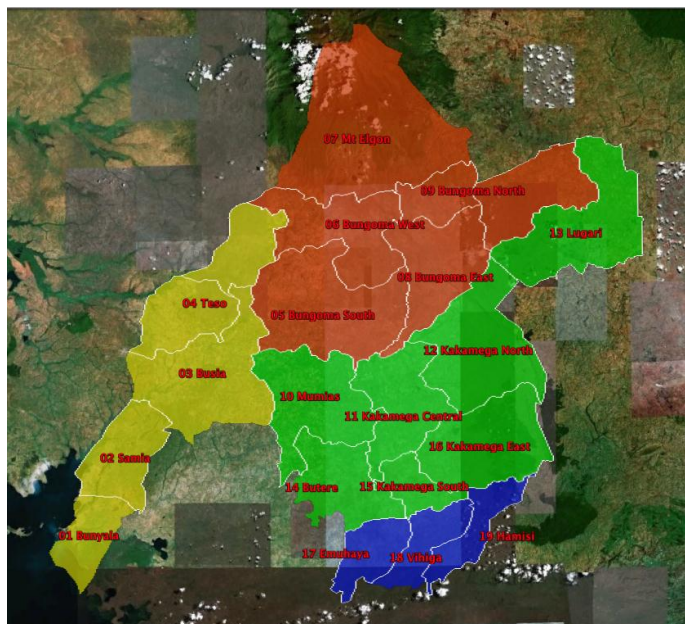


Figure 1: Districts included in project activity

A.4.1.1. Host Party(ies):

Republic of Kenya.



A.4.1.2.	Region/State/Province etc.:
Please see Annex 5.	
A.4.1.3.	City/Town/Community etc.:
Please see Annex 5.	
A.4.1.4.	Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

Across the 19 districts in the Western Province of Kenya, a total of 687 distribution sites will be used to distribute the LifeStraw® Family to community members. These are shown on the following map, and are presented with names and GPS coordinates in Annex 5.

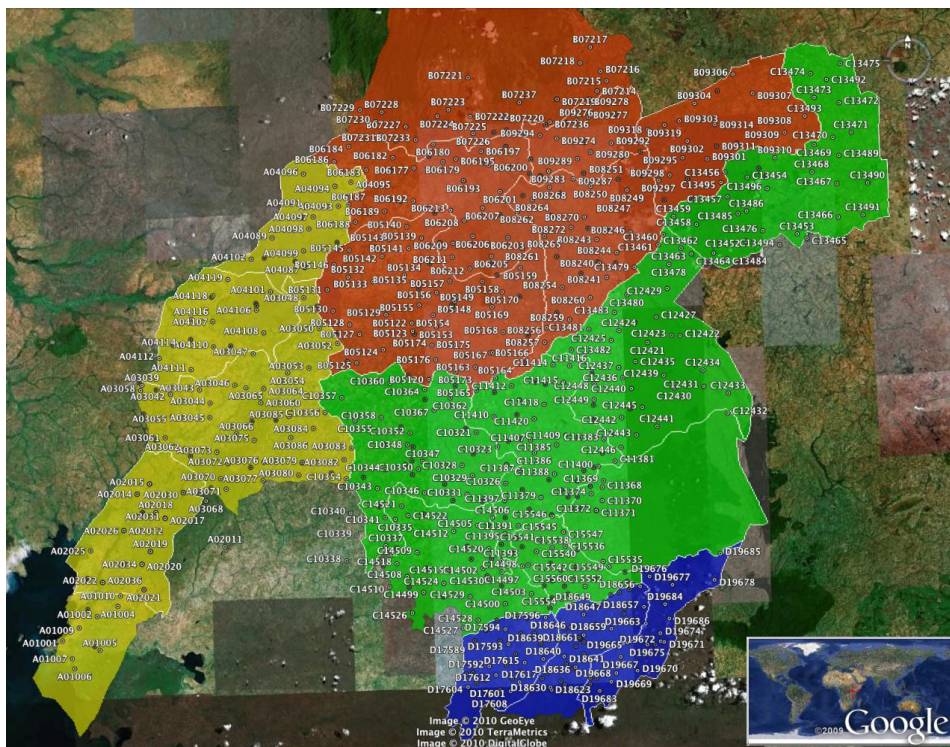


Figure 2: Distribution sites included in project activity

The project proponent will distribute LifeStraw® Family units to women attending the Integrated Prevention Campaign over a period of four to six weeks. The project proponent will record the actual number of LifeStraw® Family units distributed at each distribution site, along with the names, addresses and telephone numbers, when available, from each recipient.

Therefore, the project proponent has defined the project boundary as inclusive of any LifeStraw® Family units distributed during the Integrated Prevention Campaign at any of the distribution sites listed, and the



customer database required by the methodology will be created and maintained based on those residents issued LifeStraw® Families at the campaign. Random monitoring will be based on this database.

The target population is approximately 80% of women between 15 and 64. Based on current population estimates, this is a total of, conservatively, 1,024,000 people.¹ This yields an estimate for the baseline population using the LifeStraw® Family, and therefore the expected emissions reductions.

A.4.2. Category(ies) of project activity:

End-Use Energy Efficiency Improvement, using Gold Standard Methodology for Improved Cook-Stoves and Kitchen Regimes, V.02.

A.4.3. Technology to be employed by the project activity:

The LifeStraw® Family is a point-of-use microbial water treatment system intended for routine use in low-income settings. The system filters up to 18,000 liters of water, enough to supply a family of five with microbiologically clean drinking water for three years, thus removing the need for repeat intervention. The system requires no electricity or consumables. The system complies with US Environmental Protection Agency Guide Standard and Protocol for Testing Microbiological Water Purifiers, providing treated water that is as-good or better than boiling for microbiological contamination. The system is shown in the image below, followed by a pictorial of appropriate use.



Figure 3: LifeStraw® Family System

¹ Population Projections for Kenya 2000-2020 (Revised), DHS

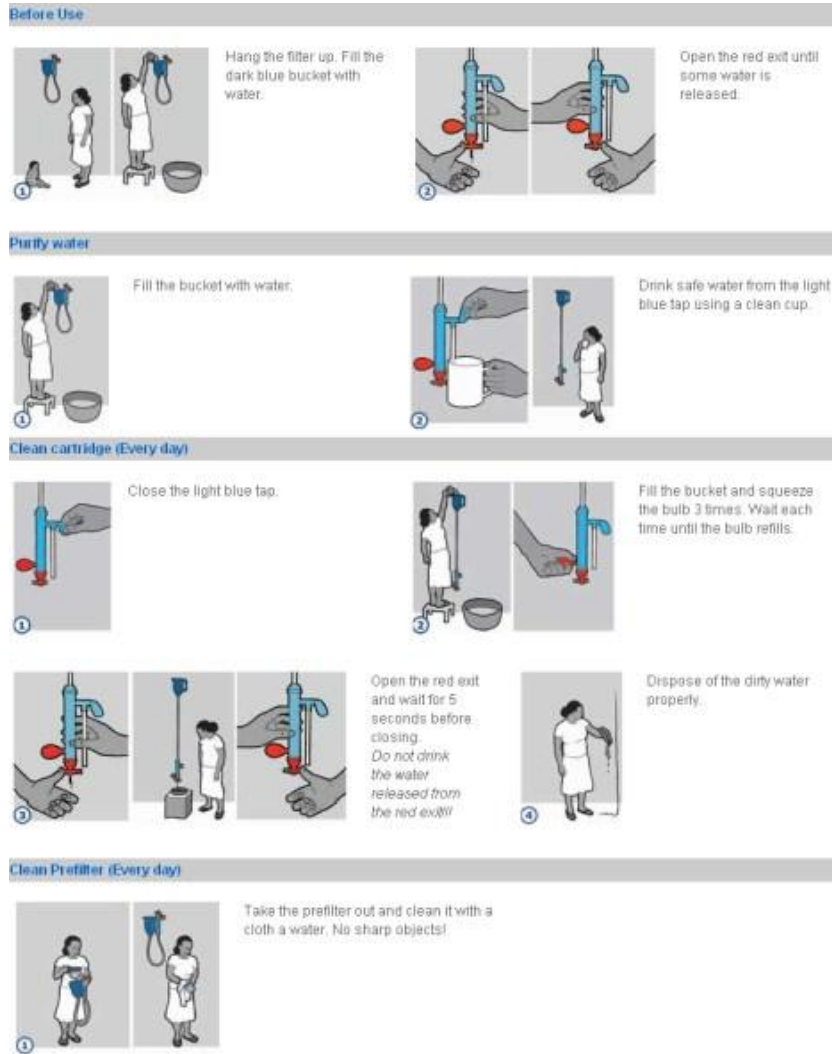


Figure 4: LifeStraw® Family Use

In independent testing, the LifeStraw® Family unit lasted at least three years of typical use. Therefore, the project proponent will plan to either repair or replace the LifeStraw® Family unit after approximately three years of use, using revenue generated from the emission reduction sales. Earlier or later replacement will be conducted as appropriate, based on the condition of the LifeStraw® Family units.

**A.4.4. Estimated amount of emission reductions over the chosen crediting period:****Table 1: Estimated emission reductions**

Year	Estimation of annual emission reductions in tonnes of CO ₂ e
1	2,073,328
2	2,073,328
3	2,073,328
4	2,073,328
5	2,073,328
6	2,073,328
7	2,073,328
8	2,073,328
9	2,073,328
10	2,073,328
Total estimated reductions (tonnes of CO₂e)	20,733,280
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period (tonnes of CO₂e)	2,073,328

A.4.5. Public funding of the project activity:

No public funding is used for this project activity.

SECTION B. Application of a baseline and monitoring methodology**B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:**

The following approved Gold Standard Foundation baseline and monitoring methodology is applied to the project activity:

Title: Indicative Programme, Baseline, and Monitoring Methodology for Improved Cook-Stoves and Kitchen Regimes, V.02, February 8, 2010.

Reference: Gold Standard Website:

http://www.cdmgoldstandard.org/fileadmin/editors/files/6_GS_technical_docs/manuals_and_methodologies/V02_08-02-10_GS_Cook-stove_Methodology.pdf

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

This methodology is applicable to programs or activities introducing improved cook-stoves or water treatment technology (e.g. water filters) and practices to households and institutions that result in improved kitchen regimes within a distinct geographical area. The following conditions apply:



- Low-emission cook-stoves and regimes (water treatment) replace relatively high-emission baseline scenarios.
- The project boundary can be clearly identified, and the stoves or water treatment technology counted in the project are not included in another voluntary market or CDM project (i.e. no double-counting takes place).
- The project is located in a single country.
- The improved cook-stoves or water treatment technology do not number more than ten per kitchen and each have continuous useful energy outputs of less than 50kW (defined as total energy delivered usefully from start to end of operation divided by time of operation).

B.3. Description of the sources and gases included in the project boundary:

The project reduces the amount of green house gases (GHGs) emitted through the use of fuel wood, by introducing widespread use of zero emission water treatment technology which replaces existing inefficient stoves. To ensure conservative estimates on emission reductions, the project will not account for GHG reductions attributable to production and transportation.

Baseline	Source	Gas	Included?	Justification/Explanation
	Cooking (boiling water) only	CO ₂	Yes	Important source of emissions
		CH ₄	Yes	Important source of emissions
		N ₂ O	Yes	Important source of emissions

Project Activity	Source	Gas	Included?	Justification/Explanation
	Cooking (boiling treated water) only	CO ₂	Yes	Important source of emissions
		CH ₄	Yes	Important source of emissions
		N ₂ O	Yes	Important source of emissions

Leakage	Source	Gas	Included?	Justification/Explanation
	Production and transportation of water treatment system	CO ₂	Yes	Important source of emissions
		CH ₄	No	Insignificant source of emissions
		N ₂ O	No	Insignificant source of emissions

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

In rural western Kenya, residents drink from water sources containing microbiological contamination. This leads to diarrhea and other water-borne diseases, and accounts for, according the World Health Organization, the third leading cause of death in Kenya among children and adults. To attempt to guard against this, the prevailing practice in rural Kenya is to boil drinking water with wood². However, many families lack the resources to afford the wood, which is scarce and demonstrably non-renewable.

Therefore, the baseline scenario in western Kenya is a demand for non-renewable biomass use to treat drinking water on rudimentary cookstoves.

² Kenya National Bureau of Statistics, *Kenya Demographic and Health Survey 2008-09*, June 2010, http://www.measuredhs.com/pubs/pub_details.cfm?ID=1008&ctry_id=20&SrchTp=.



As described in Annex 3 of the methodology, the baseline scenario is the existing kitchen practice of boiling water to treat water for consumption on stoves using high emission fuels including non-renewable biomass and fossil fuels. As stated in the Suppressed demand and satisfactory level of service section of Annex 3 in the methodology, in order to account for suppressed demand such as that in western Kenya where there is not a satisfactory level of service in terms of treated water available for consumption, inhibited by insufficient energy to meet basic water treatment needs, the baseline is the total amount of treated water for consumption per person per day. However, for ex-ante emissions reductions calculations, Approach 1 of the Methodology will be applied.

Evolving Baseline

While all of the LifeStraw® Family units will be distributed at the start of the project period, some conditions are expected to change throughout the project period. Therefore, an evolving baseline approach is used. Baseline parameters that are monitored are documented in B.7.1.Approach 1, using relevant IPCC default values, is used to calculate baseline emissions. Emission Factors are assumed to be constant throughout the project period, therefore they are assumed constant and not monitored.

Clusters

Following section 4.1 of the methodology, the project proponent determined the number and nature of clusters in the project activity. The methodology describes in detail how to determine clusters for cookstove projects. For this water treatment activity, the project proponent applied the guidelines as applicable for this project. A pilot study was conducted in 2008 that determined the target population for this program.

The Kitchen Survey determined that the predominant fuel used is firewood³. Separately, the BWBT in a follow up survey determined that residents exclusively use biomass for water boiling, the activity of interest in this project, and that no alternative or renewable energy sources are used. It is assumed that any alternative fuels, such as charcoal or plastics, are subsumed by assuming emissions from firewood use, which is conservative. Separately, the project proponent has accounted for the fraction of NRB used in the region.

Therefore, the project proponent has determined that a single cluster for the entire project is appropriate, based on the following data:

1. Biomass was the only observed fuel for water treatment.
2. Alternative fuels observed are of higher emission values, and therefore are subsumed and emissions conservative if grouped with biomass.
3. NRB fraction is monitored.
4. Consideration of alternative water treatment systems is accounted for separately by monitoring parameters.
5. There is only a single water treatment technology being deployed, over a short period of time to a fixed population, therefore there are no appropriate distinctions between population clusters.

³ SUSTAINABLE DEPLOYMENT OF THE LIFESTRAW® FAMILY IN RURAL KENYA, Kitchen Survey - Sample size-115 households, 5 questionnaires were administered per district in the 23 districts, August 1, 2010, EXP www.expagency.biz

**Alternative Fuels ($AF_{bl,i,y}$)**

Woody biomass was the exclusive fuel used for boiling water found during the Baseline Survey (see Annex 3). While some households used plastic products to start the fire, plastic combustion emissions are significantly worse than biomass, so therefore assuming biomass is a conservative assumption. Some families also used charcoal or paraffin stoves for cooking, though these were not observed when boiling water for sterilization. Therefore, alternative fuel was assigned a value of zero for the development of the baseline and project emissions.

GHG Emissions During Fuel Production

As the only fuel included in the baseline calculation is woody biomass, GHG emissions do to the production of fuels are not considered. Additionally, GHG emissions do to fuel transportation are not considered to maintain conservativeness.

Treated Water for Consumption ($L_{bl,i,y}$)

As described in Annex 3 of the methodology, this parameter is the amount of treated water for consumption per person per day. This is equal to the amount of raw water treated plus the amount of raw water boiled after the introduction of the water treatment technology, and is capped at 7.5 liters/person/day.

Each LifeStraw® Family is capable of treating 18,000 liters. For an average family of 4, this translates to 4.11 liters/day/person over a 3 year period. The average family size is derived based on population data. While a baseline Kitchen Survey determined that the average family size was 6-7 people⁴, in many instances these families include several women who will receive LifeStraw® Family units during the campaign.

In order to reach every family in the Western Province, the target population for the distribution is approximately 80% of women between 15 and 64. Based on current population estimates, this is a total of, conservatively, 1,024,000 people.⁵

Population data for the Western Province indicated more than four million people. Therefore, the average number of people served by a LifeStraw® Family unit will be conservatively 4.

Non-Renewable Biomass

In accordance with Annex 1 of the methodology, non-renewability of woody biomass fuels was assessed using a quantitative approach. Due to the size of the project, the large geographic area that is encompassed in the Fuel Collection Area, and the limited forestry data available for Kenya, aggregate national biomass data has been used to determine a conservative NRB fraction for all collection areas within the project boundary.

In accordance with Annex 1, the quantity of NRB is calculated as follows:

$$NRB = H - MAI$$

Where,

H = the annual harvest of woody biomass (demand)

⁴ SUSTAINABLE DEPLOYMENT OF THE LIFESTRAW® FAMILY IN RURAL KENYA, Kitchen Survey - Sample size-115 households, 5 questionnaires were administered per district in the 23 districts, August 1, 2010, EXP www.expagency.biz

⁵ Population Projections for Kenya 2000-2020 (Revised), DHS



MAI = sum of the mean annual increments, or “re-growth” (supply)

NRB = non-renewable biomass or excess harvest above re-growth

The Food and Agriculture Organization of the United Nations has conducted Forestry Outlook Studies (FOSA)⁶ in Kenya that were in part based upon the Kenya Forestry Master Plan conducted during the mid-90's. This report, which is used by the National Environmental Management Authority (NEMA) and the Kenya Forestry Working Group, provided sustainable annual wood fuel yield from closed indigenous forests, woodlands and shrublands, farmlands and settlements, and forest plantations. An average wood density for Africa of 0.58 tonnes/m³ is used⁷. The figures used and the resulting MAI are provided in the following table:

	Sustainable annual wood fuel		area		density (tonnes / m ³)	MAI	
Closed indigenous forests	0.9	m ³ / ha (page 25 para 1 FOSA)	1.22	M ha (table 2, page 25) FOSA	0.58	0.637	M tonnes / year
Woodlands and shrublands	0.2848	m ³ / ha (page 25 para 3 FOSA. 2% of 14.24 m ³ /ha)	36.6	M ha (table 2, page 25) FOSA	0.58	6.046	M tonnes / year
Farmlands and settlements	0.1752	(pg 26 FOSA - 2% sustainable yield from 73% of 12 m ³ /ha (extrapolated from 9 in 2000 and 15 in 2020))	10.62	M ha (table 2, page 25) FOSA	0.58	1.079	M tonnes / year
Forest plantations	3.37	m ³ / ha (table 6, page 42 for woodfuel FOSA)	0.107	M ha (table 2, page 25) FOSA	0.58	0.209	M tonnes / year
Total MAI						7.971	M tonnes / year

Woodfuel demand was then derived from the UNEP Kenya: Integrated assessment of the Energy Policy report of 2006⁸ as 26.867 million tonnes per year for 2010. Therefore:

$$\text{NRB} = 26.867 \text{ million tonnes} - 7.971 \text{ million tonnes}$$

$$\text{NRB} = 18.90 \text{ million tonnes}$$

The fraction of extracted woody biomass that is non-renewable (X_{nrh}) is calculated as follows:

⁶ FAO Forestry Department, *Forest Outlook Studies in Africa (FOSA)*, Kenya, 2000, <http://ftp.fao.org/docrep/fao/003/AB569E/AB569E00.pdf>.

⁷ FAO Forestry Department, *Global Forest Resources Assessment Country Report for Kenya*, 2005, <http://ftp.fao.org/docrep/fao/010/ai877E/ai877E00.pdf>.

⁸ UNEP Kenya: Integrated assessment of the Energy Policy, www.unep.ch/etb/areas/pdf/Kenya%20ReportFINAL.pdf, 2006



$$X_{\text{nr}} = (\text{NRB}/H)$$

$$X_{\text{nr}} = 18.90 \text{ million tonnes} / 26.867 \text{ million tonnes}$$

$$X_{\text{nr}}^{\text{initial}} = 0.70$$

This NRB fraction was then discounted to account for renewable crop residue use in Kenya. Kituyi, 2001⁹ describes a 57% increase in fuel wood use between 1995 and 2010. Assuming a corresponding increase in crop residue use for fuel, the crop residue use for 2010 is approximately 2.2056 million tonnes. This yields approximately 7.59% biomass by mass for crop residue use. Using IPCC default values for energy value from charcoal, wood and crop residue, as shown in the following table, the energy value contribution from the crop residue use is approximately 5% of the total. Therefore, the total equivalent biomass equivalent contribution from crop residue use is 7.17% of the total. Therefore the initial NRB fraction is adjusted by 92.83%. Therefore, the final NRB fraction is:

$$X_{\text{nr}}^{\text{final}} = 0.65$$

Adjustment for crop residue use			Energy value		Energy consumption (TJ)
Crop residue use	2.2056	M (tonnes / year) Kituyi 2001	15.6	TJ/Gg (IPCC default)	34.41
Charcoal production	10.667	M tonnes / year (UNEP Integrated assessment of the Energy Policy)	29.5	TJ/Gg (IPCC default)	314.68
Charcoal consumption	1.6	M tonnes / year (UNEP Integrated assessment of the Energy Policy)	29.5	TJ/Gg (IPCC default)	47.20
Firewood	14.6	M tonnes / year (UNEP Integrated assessment of the Energy Policy)	15.6	TJ/Gg (IPCC default)	227.76
Percentage of residue use to total	7.59%				
Energy use from non-residue biomass	94.49%				
Equivalent biomass contribution from residues	7.17%				
Adjusted X _{nr}	65%				

Fraction of population boiling or would boil in the baseline (X_{boil})

⁹ Kituyi, "Biofuel availability and domestic use patterns in Kenya," Biomass and Bioenergy, Volume 20, Issue 2, Pages 71-82, 2001



The project proponent will only claim emission reductions for residents who currently boil, or would boil their water if barriers were reduced, in the baseline. The project proponent sought clarification from the Gold Standard on how to determine this factor from the Chair of the GS Technical Advisory Committee, as well as the GS Deputy Technical Director. In response, the project proponent was provided with this guidance from the GS Deputy Technical Director:

A scenario was outlined wherein:

”Some households in target area drink untreated water, some drink boiled water and remaining drink water treated by other techniques in pre-project scenario.”

”In this scenario I think that households that drink untreated water and those that drink boiled water in pre-project scenario will form part of different clusters. Households that drink water treated by other techniques will not form part of the project activity. The PP can potentially use BWBT from households that drink boiled water in pre-project scenario and apply it to households that drink untreated water. Again these two clusters can be merged making conservative assumption.

This merging does not lead to conservative emission reductions but given the suppressed demand aspect this deviation can be accepted. Further, as you suggested, PP should assume same proportion of households drinking untreated water to shift to drinking boiled water as is the proportion between households drinking boiled water & those drinking water treated by other techniques in Target Area.”

The project proponent therefore designed the emission reduction calculations precisely as outlined. The project proponent has merged the two clusters of end-users who boil in the pre-project scenario with the people who currently do not boil but WOULD boil if resources were provided. And the project proponent has excluded end-users who currently use alternative forms of treatment or WOULD if resources were available. Therefore, the project as presented is consistent with the guidance provided by the Gold Standard authorities.

To determine this population fraction parameter, 17 data collection surveys were conducted across 9 districts in the western province. These results indicated that between 71% and 82% of the people in the region either currently boil drinking water, or would boil it if resources were more readily available.¹⁰

Therefore, the project proponent will use the most conservative value for the baseline: $X_{\text{boil}} = 0.71$.

The project proponent will directly monitor this parameter.

Suppressed Demand

As stated in the methodology, the boiling of water requires both the collection, or purchase, of wood-fuel and a household member to boil the water taking 20-30 minutes. This prevents barriers to households in developing countries resulting in a suppressed demand for a satisfactory level of service. The Kitchen Survey conducted within the project boundary found that households were only able to boil 3 liters of water per family (average 4-6 individuals per family) per day to meet their drinking water needs. Respondants in the survey also indicated that firewood is becoming scarce as trees have been felled and used as firewood, burned to obtain charcoal, and used for construction of homes. The WHO, as indicated in

¹⁰ EXP Agency, Mini-survey-results.xls, September 10, 2010



Annex 3 of the methodology, states that 7.5 lppd meet the basic needs for treated water. The project activity will be providing 4.11 lppd which is satisfactory but below the WHO level capped by the methodology.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Additionality for the project activity is demonstrated using the UNFCCC methodological tool “Tool for the Demonstration and Assessment of Additionality” (Version 5.2).

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

Sub-step 1a: Define alternatives to the project activity:

- I. The proposed project activity without carbon finance.
- II. Energy for boiling water delivered at household through the use of fossil fuels or electricity.
- III. An alternative point-of-use water treatment system using renewable energy.
- IV. No action is taken. Continuation of the current situation.

Sub-step 1b: Consistency with mandatory laws and regulations:

There are no national laws or regulations in Kenya that would restrict the implementation of any of these alternative project activities. The proposed project activity is therefore not the only alternative amongst those considered that is in compliance with mandatory regulations.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method:

A simple cost analysis is used since the project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than VER related income.

Sub-Step 2b: Option I. Apply simple cost analysis

The project activity will provide clean drinking water without cost to the users, or the local/national government. The Republic of Kenya has indicated “there are currently no regulations or incentives in Kenya that allow economically sustainable distribution of [LifeStraw® Family water treatment] technologies¹¹.” Therefore, there are no financial or economic benefits other than carbon finance related income.

While Vestergaard S.A. has been able to secure donor commitments for other elements of the IPC, funding for the LifeStraw® Family component is not forthcoming. Donors are well organized in addressing other IPC activities, including HIV testing, family planning, and malaria reduction. However, without the benefit of carbon finance, Vestergaard S.A. would not finance this program, as reported to the Gold Standard Foundation¹².

¹¹ Republic of Kenya, Ministry of Public Health and Sanitation, letter to The Gold Standard Foundation, July 15, 2010.

¹² Peterson, Johnny, CFO of Vestergaard S.A., letter to The Gold Standard Foundation, August 6, 2010.



The project activity costs approximately US\$22.5 million to distribute all of the LifeStraw® Family units. There are no known existing investment, donor or government resources sufficient to meet this investment requirement. The existing prevailing practice of boiling water with wood has a lower cost to the end-user, as in the baseline the end-users are using non-renewable biomass obtained locally.

The following table presents all major donors that Vestergaard Fradsen approached prior to engaging in developing this carbon finance activity. As is shown, the predominant barriers to donor financing included concerns about sustainability without sustained revenue, and availability of funds for water activities. Most donors support other sectors, and therefore finding donor funding in absence of the benefit of carbon finance is the primary additionality barrier.

Table 2: International Donors Approached for LifeStraw® Family Funding

Partner	Dates: Initial proposal submitted or information presented through feedback	Reason Given for being unable to fund LifeStraw Technology
AFDB (African Development Bank)	April 2010 - June 2010	None- proposal being discussed; sustainability is a major requirement hence proposal requires the endorsement of a third party, e.g. government. Limits are low.
Clinton Foundation	February 2010 - March 2010	No Funding available for this commodity.
DANIDA	April 20, 2010 - May 20, 2010	No Funding- with their limited funding have supported a different health system strengthening activity
DFID	January 2010- June 2010	Issues raised about cost-effectiveness (before we mentioned carbon credit), sustainability and lack of linkages to their maternal and child health programme
EU	April 2010 - May 2010	None- proposal being prepared; sustainability is a major requirement hence proposal requires the endorsement of a third party, e.g. government. Limits are low.
France	February 2010 - May 2010	No Funding for this commodity in plans this year- Such funding requires planning up to 2 years in advance. Have already funded the Urban water development planning through AFD.
German Development Cooperation and German Embassy	January 2010- April 2010	Discussions ongoing.
JICA & Japanese Embassy	March 2010 - June 2010	Discussions ongoing.
UNAIDS	January 2010 - May 2010	No Funding for such included in their workplan.
UNFPA	December 2009 - May 2010	No Funding for such activities; not in their annual workplan.



UNICEF	December 2009 - May 2010	As of August 9, UNICEF will join us in Busia District; sustainability a major issue, required introduction by Government to ensure project sustainability and harmonization with national operational plans. Exact extent of their "engagement" being discussed.
USG	January 2010 - May 2010	Discussions ongoing.
WFP	January 2010- April 2010	No Funding
WHO	May 2010	Raised issues about sustainability and harmonization with health sector plans.
WORLD BANK	April 2010 - May 2010	No formal/ final communication received by August.
Development Partners for Health In Kenya Secretariat	February 2010 - May 2010	This was not in the annual plan of DPHK, hence no funding was allocated by most members.
Italian Embassy	March 2010 - June 2010	No Funding.
Sweden	June 2010	No funding for this particular activity.
Spain	June 2010	Discussions ongoing to ascertain funding availability.
Switzerland e.g. Swiss Devt Cooperation	June 2010	Discussions ongoing.
Norway	May 2010 - June 2010	Discussions ongoing
Netherlands	June 2010	No funding for this particular commodity for this year; have funded WASH programme of Unicef and Water Services Trust Fund.

Previous similar projects were of limited scope. A previous project conducted by the PP without carbon finance was a pilot study for the larger program presented here, and was funded independently as a method of demonstrating the value of integrated health interventions. However, this project could not be scaled to have an impact of about 4M people without carbon revenue. Other similar water projects, such as other filters, chlorine or water treatment plants, do not have the capacity to distribute clean water to over 4M people because of the significant cost and lack of available loans, grant or government funding.

Step 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

Prevailing Practice Barriers

With little access to piped, potable water throughout the country¹³, most families do not have access to reliably clean water. The baseline survey found that families collected water from dams (30%), public water taps (35%), and rivers/lakes (24%). Less than 1% of respondents within the project boundary had access to a personal tap¹⁴. The government of Kenya has confirmed that many families lack the resources to afford the wood needed to sterilize water¹⁵. With most families lacking the resources to afford wood, it

¹³ 19% of Kenyans (44% in urban areas and 12% in rural areas) are reported as having access to piped water through a house or yard connection, WHO/UNICEF, Joint Monitoring Programme for Water Supply and Sanitation, *Improved Drinking-Water Sources Kenya*, March 2010.

¹⁴ SUSTAINABLE DEPLOYMENT OF THE LIFESTRAW® FAMILY IN RURAL KENYA, Kitchen Survey - Sample size-115 households, 5 questionnaires were administered per district in the 23 districts, August 1, 2010, EXP www.expagency.biz

¹⁵ Republic of Kenya, Ministry of Public Health and Sanitation, letter to The Gold Standard Foundation, July 15, 2010.



is evident they also lack the resources to purchase alternative forms of point-of-use water treatment systems. The mass distribution of the LifeStraw® Family water treatment technology is a first of its kind in the project region (based on the scale of the project), however its adoption due to prevailing practice would not be possible without the support of the carbon finance market.

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

Alternative IV is not subject to investment or prevailing practice barriers as this option reflects business as usual. Both alternatives II and III are prevented based on financial barriers in Kenya. There are no further credible or realistic alternatives identified because all other water treatment technologies have significant financial barriers that are not likely to overcome by the Government of Kenya or any donor or company.

Step 4: Common practice analysis

The project proponent has established that, technologically, there are several other interventions existing in Kenya. Firstly, the NGO Water For All has purchased, through a grant from the Coca-Cola Foundation, approximately 12,000 LifeStraw® Family units to be distributed in eastern Kenya. Separately, the Kenya Ministry of Health periodically distributes chlorine water treatment to some regions in Kenya.

However, these projects, as well as other known water treatment interventions, do not approach the scale of this project activity. The Water For All project has a scale that is less than 1% of this project activity, while the Ministry of Health has stated that chlorine interventions target very few residents, are conducted infrequently, and are not well funded.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions

Approach 1 per the methodology is used to estimate baseline emissions.

$$BE_y = [B_{bl,y} \times i \times X_{boil}] \times [X_{nr,bl,y} \times EF_{bl,bio,co2} + EF_{bl,bio,ch4} + EF_{bl,bio,n2o}] \dots \dots \dots \text{Eqn B.1a (modified)}$$

Where

BE_y = baseline emissions in year y (in tonnes CO₂e per year)

$X_{nr,bl,y}$ = the non-renewable fraction of the woody biomass harvested in the project collection area in year y in the baseline scenario

$B_{bl,y}$ = the mass of woody biomass consumed during boiling in the baseline in year y (tonnes/year).

i = Number of water treatment units in place

X_{boil} = fraction of users that boil water as a form of water treatment (additional parameter not identified in the methodology)



$EF_{bl,bio,co2,net}$ = the CO₂ emission factor for use of the biomass fuel in the baseline scenario in tonnes CO₂ per tonne fuel (tonnes/TJ)

NCV = Net calorific value of biomass used (woodfuel) (TJ/tonne)

$EF_{bl,bio,co2} = EF_{bl,bio,co2,net} \times NCV$ = CO₂ emission factor for wood (tonnes CO₂/tonne woodfuel)

$EF_{bl,bio,ch4,net}$ = the CH₄ emission factor for use of the biomass fuel in the baseline scenario in tonnes CO₂ per tonne fuel (tonnes CH₄/tonne biomass)

GWP_{CH4} = The global warming potential for CH₄

$EF_{bl,bio,ch4} = EF_{bl,bio,ch4,net} \times GWP_{CH4}$ = the CH₄ emission factor for use of the biomass fuel in the baseline scenario in tonnes CO₂ per tonne fuel (tonnes CO₂/tonne biomass)

$EF_{bl,bio,n2o,net}$ = the N₂O emission factor for use of the biomass fuel in the baseline scenario in tonnes CO₂ per tonne fuel (tonnes N₂O/tonne biomass)

GWP_{N2O} = The global warming potential for N₂O

$EF_{bl,bio,n2o} = EF_{bl,bio,n2o,net} \times GWP_{N2O}$ = the N₂O emission factor for use of the biomass fuel in the baseline scenario in tonnes CO₂ per tonne fuel (tonnes CO₂/tonne biomass)

In accordance with Annex 3, $B_{bl,y}$ is calculated as follows:

$B_{bl,y} = L_{bl,y} \times W \times 365 \text{ days} \times P_y \dots$ for Eqn B1, B2

Where,

$L_{bl,y}$ = the total amount of treated water for consumption per person per day (in liters). This is equal to the amount of raw water treated plus the amount of raw water boiled after the introduction of the water treatment technology. This potentially takes into account a situation of suppressed demand and is capped at a maximum amount of 7.5 L/p/d.

W = amount of wood-fuel or fossil fuel (in tonnes) required to boil 1L of water on a three-stone stove to be safe for consumption

P_y = members per household in year y

Note: $AF_{bl,i,y}$ = The mass of alternative fuel i in the baseline in year y in accordance with trends projected throughout the project period, in tonnes. This mass can be set to zero in cases where the KT is appropriately designed to subsume alternative fuels (approach 3). Therefore this parameter is not included in this project activity emissions calculation.

Project Emissions

Approach 1 is applies values of mass for each fuel in the mix:



$$PE_y = [B_{pj,y} \times i \times X_{boil}] \times [X_{nr,pj,y} \times EF_{bl,bio,co2} + EF_{bl,bio,ch4} + EF_{bl,bio,n2o}] \dots \dots \dots \text{Eqn P.1a (modified)}$$

Where (noting that parameters common to baseline equations are not repeated):

PE_y = project emissions in year y (in tonnes CO₂e per year)

$X_{nr,pj,y}$ = the non-renewable fraction of the woody biomass harvested in the project collection area in year y in the project scenario

$B_{pj,y}$ = the mass of woody biomass consumed during boiling of water in the project each year (in tonnes/year).

In accordance with Annex 3, $B_{p,y}$ is calculated as follows:

$$B_{pj,y} = [W \times 365 \text{ days} \times P_y] \times [(L_{pj,y} \times U_y) + [(1 - U_y) \times L_{bl,y}]] \dots \text{for Eqn P1}$$

Where,

$L_{pj,y}$ = the total amount of water still boiled per person per day (in liters). This is equal to the amount of raw water and treated water that are boiled after the introduction of the water treatment technology.

W = amount of wood-fuel or fossil fuel (in tonnes) required to boil 1L of water on a three-stone stove to be safe for consumption

P_y = members per household in year y

In general, all project parameters are assumed consistent with the baseline emissions except for the total amount of treated water still boiled per person per day ($L_{pj,i,y}$) and the usage (or adoption) percentage of the water treatment system. These are explained as follows.

Treated water boiled ($L_{pj,i,y}$)

An education effort during deployment and monitoring of the LifeStraw® Family will strongly encourage residents to use the unit in place of boiling water for treatment. Therefore, it is assumed that residents who properly adopt the LifeStraw® Family and are using the unit appropriately, as monitored by the U_y parameter described below, will appropriately avoid boiling water for treatment.

The amount of treated water boiled and raw water boiled will be collected during the monitoring survey, when residents will be asked if they currently boil water for consumption other than cooking. If yes, the volume of water boiled per family will be recorded. This value will then be divided by the parameter $P_{i,y}$, discussed below, to account for the number of people in each household. This volume of treated, boiled water will be included with the project emission calculation.

Fraction of population adopting technology (U_y)

Not all of the LifeStraw® Family units distributed will be adopted and used appropriately by the recipients. Therefore, to be conservative, the project proponent will adjust emission reduction claims based on estimated baseline and subsequent actual survey results for adoption rate.



An independent study of the pilot campaign indicated that 83% of users surveyed were using their LifeStraw® Family unit after the pilot campaign¹⁶. The project proponent plans to expand on education efforts to increase uptake.

Therefore, for the baseline: $U_y = 0.83$

Leakage

As required per page 18 of the methodology, the project proponent has assessed several leakage scenarios. Below are listed each of the leakage forms requiring assessment, along with the project proponent response and justification.

- a) *Some users of the efficient stoves respond to the fuel savings associated with higher efficiency stoves by increasing consumption of fuels with GHG emission characteristics by retaining some use of inefficient stoves, to the extent that project emissions are higher than those calculated from the assumption that cooking energy is constant. This is sometimes referred to as the 'rebound' effect.*

This project applies the methodology to water treatment, and uses the allowed “suppression of demand” per page 35 of the methodology. As demonstrated in kitchen surveys, for those residents who do treat water, the prevailing practice is to boil it with biomass. However, the volume of water boiled in the baseline is lower than the amount of treated water that will be provided by the project, and claimed for emission reductions under “suppression of demand”. Therefore, it is unlikely that leakage emissions will be caused by increased use of biomass for treatment by boiling or other use as the current use is limited. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

- b) *The project activity stimulates increased use of a high emission fuel either for cooking or for other purposes outside the project boundary (as would be the case for example if efficient cooking stimulated an increase in NRB consumption - possibly because the NRB fuel becomes cheaper due to the project activity).*

The volume of water treated by boiling in the baseline consumes a fractional portion of the biomass used by families. Biomass is currently non-renewable and expensive for families. It seems unlikely that the biomass saved by the project activity will significantly reduce biomass costs outside the project boundary. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

- c) *By virtue of promotion and marketing of a new model and type of stove with high efficiency, the project stimulates substitution of a cooking fuel or stove type with relatively high emissions by households who commonly using a cooking fuel or stove type with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.*

This leakage parameter is not applicable in this project, where the activity is provisioning of a water treatment system. The project proponent will not be involved in promoting any particular stove or fuel type. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

¹⁶ De Ver Dye, T., Apondi, R., Lugada, E., Kahn, J., Sandiford-Day, M., DasBanerjee, T., ““You can take water any place you are:’ A Qualitative Assessment of Water-related Illness Beliefs, Behaviors, and Community Acceptance of Novel Personal Water Filtration Devices,” Department of Public Health and Preventive Medicine, Institute for Human Performance, SUNY Upstate Medical University, 2009



- d) *The project population compensates for loss of the space heating effect of inefficient cook-stoves by adopting some other form of heating or by retaining some use of inefficient stoves.*

This current use of biomass for water treatment is a small fraction of the biomass used by residents. Additionally, the Western Province of Kenya is temperate, and residents rarely, if ever, use stoves for heating. Therefore, it is unlikely that the project activity will result in increased use of biomass for space heating effects. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

- e) *The traditional stoves displaced are re-used outside the boundary in a manner suggesting more usage than would have occurred in the absence of the project.*

This leakage parameter is not applicable in this project, where the activity is provisioning of a water treatment system. The project proponent will not be involved in replacing existing stoves. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

- f) *Significant emissions from transportation or construction involved in the project activity, including emissions associated with production/transport of the efficient stoves themselves, or production/transport of project fuels (for example briquette manufacture and supply may be energy-intensive).*

There are some emissions caused by the production and transport of the LifeStraw® Family units. The project proponent has calculated conservative estimates for these emissions, and will deduct the emissions from claimed emission reductions in order to account for this leakage factor.

The estimates are as follows:

Each LifeStraw® Family unit weighs 0.53 kg¹⁷. The LifeStraw® Family unit is almost entirely made of plastic materials. A credible source for emissions caused by manufacturing plastic commodities give a range of 1.3-1.7 kg CO₂ emitted per kg of plastic material produced for several different plastics¹⁸. This source is for a plant in Japan. Therefore, in order to conservatively account for the energy efficiency differences between Japan and Vietnam, a correlation is applied. A credible source indicates that the thermal efficiency of power plants in Japan is, as of 2002, greater than 43%, while in India, the efficiency is typically less than 28%¹⁹. This is a ratio of 1.54. India is a developing country with industrial regulations that are relatively loose compared to Japan, and likely similar to those in Vietnam. Therefore, the PP conservatively will apply this ratio to the leakage calculation, thereby increasing the leakage estimates by 54% for the manufacturing of the LifeStraw® Family units. Using the most conservative value of 1.7 kg CO₂ / kg of plastic produced in Japan, and applying a 54% increase, a value of 2.62 kg CO₂ / kg plastic produced is applied.

With approximately 1,024,000 LifeStraw® Family units being distributed, the manufacturing emissions can be calculated. Assuming a conservative figure of 1,100,000 LifeStraw® Family

¹⁷ Vestergaard Frandsen LifeStraw® Family Overview Presentation, 2010

¹⁸ Narita, N., Sagisaka, M., Inaba, A., "Life Cycle Inventory Analysis of CO₂ Emissions Manufacturing Commodity Plastics in Japan," The International Journal of Life Cycle Assessment, 2002 <http://www.springerlink.com/content/85428452x9600722>

¹⁹ Morgenstern, R., Pizer, W., "Reality check: the nature and performance of voluntary environmental programs in the United States, Europe and Japan", Resources for the Future, 2007.



units, and 2.62 kg CO₂ per kg of LifeStraw® Family material, this translates to 1,527.46 metric tonnes of CO₂. Rounding up, this is conservatively 1,530 VERs per distribution of all LifeStraw® Family units planned in this project.

The LifeStraw® Family unit is then shipped overseas from Vietnam to Mombasa, Kenya, which is, conservatively, an 8,000 km journey. According to available references, shipping emissions are 10-40 grams per metric tonne per kilometer shipped²⁰. Using the most conservative value of 40 g/ton-km, this yields 187 metric tonnes of CO₂. Rounding up, this is conservatively 200 VERs per distribution of all LifeStraw® Family units planned in this project for transport from Vietnam to Kenya.

The LifeStraw® Family unit is then trucked overland from Mombasa to Kakamega, Kenya, which is, conservatively, a 1,200 km journey. According to available references, trucking emissions are 60-150 grams per metric tonne per kilometer trucked²¹. Using the most conservative value of 150 g/ton-km, this yields 105 metric tonnes of CO₂. Rounding up, this is conservatively 110 VERs per distribution of all LifeStraw® Family units planned in this project for transport within Kenya.

This yields a total of 1,840 VERs per distribution of the LifeStraw® Family, which is planned for likely three times over 10 years, and no more than four times over 10 years. This yields an annual impact of, conservatively, 736 VERs per year. This equates to approximately 1.673 kilograms of CO₂ per LifeStraw® Family distributed. This annualized leakage impact will be deducted from the VERs claimed for issuance.

The project proponent may develop a reparable LifeStraw® Family unit in order to reduce redeployment costs. This will lower the amount of raw materials required to resupply the units, and therefore will lower the leakage. Therefore, even if the project restores the units rather than replacing them, this leakage estimation remains very conservative.

Additionally, the project proponent has taken into account leakage associated with disposal of the LifeStraw® Family unit. The most conservative reasonable assumption on disposal is that all the LSF units are disposed of every three years. The prevailing practice for disposal in Kenya is landfill, and the project proponent will ensure that, if any units are disposed of, it will be by landfill and not by incineration. Therefore, emissions associated with disposal of the plastic LifeStraw® Family unit, an inert non-toxic polymer material, is assumed to be zero, as decomposition of this plastic in a landfill does not cause significant emissions.²²

- g) *The non-renewable biomass saved under the project activity is used by non-project households/users who previously used renewable energy sources.*

There are no known significant renewable energy sources used by residents in or near the project boundary. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

²⁰ CO₂ Emissions for shipping of goods, Time For Change, <http://timeforchange.org/co2-emissions-shipping-goods>

²¹ CO₂ Emissions for shipping of goods, Time For Change, <http://timeforchange.org/co2-emissions-shipping-goods>

²² Nielsen, P., Hauschild, M., Product Specific Emissions from Municipal Solid Waste Landfills, LCA Methodology, International Journal of Life Cycle Analysis, V3N4, 1998



- h) *The non-renewable biomass saved under the project activity is used to justify the baseline of other project activities.*

There are no other projects known to the project developer that would use the saved biomass to justify their own baseline. Therefore, the project proponent assigns a value of 0 to this leakage parameter.

Emission Reductions

The overall reductions of GHG induced by the project are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \dots \dots \text{Eqn ER.1a}$$

Where:

ER_y = Emission reduction in total project population in year y (tCO₂e/yr)
 BE_y = Baseline emissions of in year y (tCO₂e/yr)
 PE_y = Project emissions of in year y (tCO₂e/yr)
 LE_y = Leakage in year y (tCO₂e/yr)

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

Data / Parameter:	AF _{bl,i,y}
Data unit:	Tfuel/year
Description:	Alternative fuel consumed in the baseline
Source of data used:	BWBT
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Woody biomass was the exclusive fuel used for boiling water found during the Baseline Survey (see Annex 3). While some households used plastic products to start the fire, plastic combustion emissions are significantly worse than biomass, so therefore assuming biomass is a conservative assumption. Some families also used charcoal or paraffin stoves for cooking, though these were not observed when boiling water for sterilization. Therefore, alternative fuel was assigned a value of zero for the development of the baseline and project emissions.
Any comment:	

Data / Parameter:	EF _{bl,bio,co2}
Data unit:	tCO ₂ /tonne
Description:	CO ₂ emission factor for wood
Source of data used:	IPCC default value, 2006 Guidelines, Vol. 2, Ch. 2, Table 2.5
Value applied:	1.7472
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC net CO ₂ emission factor for wood is 112 tCO ₂ /TJ. The IPCC Net Calorific Value (NCV) for wood is 0.0156 TJ/tonne.
Any comment:	



Data / Parameter:	EF _{bl.bio, ch4}
Data unit:	tCO ₂ /tonne
Description:	CH ₄ emission factor for wood
Source of data used:	IPCC default, 2006 Guidelines, Vol. 2, Ch. 2, Table 2.9
Value applied:	0.4009824
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC net CH ₄ emission factor for wood is 1.224 tCO ₂ /TJ. The IPCC Net Calorific Value (NCV) for wood is 0.0156 TJ/tonne. The Global Warming Potential (GWP) for CH ₄ is 21.
Any comment:	

Data / Parameter:	EF _{bl.bio, n2o}
Data unit:	tCO ₂ /tonne
Description:	N ₂ O emission factor for wood
Source of data used:	IPCC default, 2006 Guidelines, Vol. 2, Ch. 2, Table 2.9
Value applied:	0.054405
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC net N ₂ O emission factor for wood is 0.01125 tCO ₂ /TJ. The IPCC Net Calorific Value (NCV) for wood is 0.0156 TJ/tonne. The Global Warming Potential (GWP) for CH ₄ is 310.
Any comment:	

Data / Parameter:	F _v
Data unit:	Percentage
Description:	Performance of water treatment units in place
Source of data used:	Refer to manufacturer guarantee.
Value applied:	100%
Any comment:	<p>The performance of the LifeStraw® Family will be assumed to be 100%, per allowance by the methodology to reference manufacturer guarantees as an ex-ante factor.</p> <p>Per page 37 of the methodology, “Performance survey: to check whether water treatment units continue to meet the specifications stated by the manufacturer (eg through a mechanism on a water filter that indicates when the unit must be replaced or other way to confirm the useful life of the product is still in service). If the product meets Standards with a Guaranteed lifetime – this can become an ex-ante factor.”</p> <p>The manufacturer guarantee for this product states:</p> <p>“Vestergaard Frandsen conducts 100% testing and inspection of LifeStraw® Family when the filters leave the factory. While some field failures can be attributed to the challenging environments in which this product is used, we guarantee that at least 90% of the units will meet 90% of the specified microbiological performance levels for three years based on purifying capacity of 18,000 liters after invoicing, if used and maintained in accordance with the</p>



	<p>manufacturer's instructions. If any shipment of LifeStraw® Family filters fails to meet this guaranteed performance threshold, Vestergaard Frandsen will satisfy this guarantee by making up the deficiency with replacement filters.”²³</p> <p>The methodology specifically allows a 90% confidence interval in data collection, such as on page 10, and this is the same confidence interval provided by the LifeStraw® manufacturer in their guarantee. Therefore, assuming 100% performance compliance “if used and maintained in accordance with the manufacturer’s instructions” is consistent with the methodology.</p> <p>Parameter U_y, the usage survey, accounts for ensuring that the unit is “used and maintained in accordance with the manufacturer’s instructions”, and therefore additional monitoring is not required.</p>
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B.6.3. Ex-ante calculation of emission reductions:

Ex-ante emission reduction estimates are calculated as follows. Using equations listed in section B.4, the baseline emission estimates are calculated. Note that these baseline emissions include estimated emissions based on suppression of demand allowed by the methodology. The spreadsheet used to perform this calculation is provided upon request.

Table 3: Baseline emissions

Line	Description	Parameter	Value
1	Number of Lifestraws distributed	i	1024000
2	Adjustment for % alternative water treatment	X_{boil}	71.0%
3	Nonrenewable Biomass %	X_{nrb}	65%
4	Treated water per person/day (l/day)	L_{bl}	4.11
5	Wood used to boil 1 liter water (kg/l)	W_i	0.36
6	Members per LifeStraw®	P_i	4
7	Biomass consumption per year (t/yr)	B_{bl}	1570563
8	CO2 emission factor for wood (tonnes/TJ)	$EF_{bl,bio,co2,net}$	112
9	Net Calorific Value (NCV) of wood (TJ/t)	NCV	0.0156
10	CO2 emission factor for wood (tonnes/t)	$EF_{bl,bio,co2}$	1.7472
11	CH4 emission factor for wood (tonnes/TJ)	$EF_{bl,bio,ch4,net}$	1.224
12	GWP CH4		21
13	CH4 emission factor for wood (tonnes/t)	$EF_{bl,bio,ch4}$	0.4009824
14	N2O emission factor for wood (t/TJ)	$EF_{bl,bio,n2o,net}$	0.01125
15	GWP N2O		310
16	N2O emission factor for wood (tonnes/TJ)	$EF_{bl,bio,n2o}$	0.054405
17	Baseline emissions (tCO2e/yr)	BE	2,498,872

²³ LifeStrawFamily Guarantee, Vestergaard Frandsen Disease Control Textiles <http://www.vestergaard-frandsen.com/lifestraw/lifestraw-family/guarantee>, 2010



Next, the project emissions are calculated. Note that the project emissions account for un-realized suppression of demand, wherein project emissions included those residents that do not use the water treatment system and/or still boil water. These calculations are based on the equations presented in B.6.

Table 4: Project emissions

Line	Description	Parameter	Value
1	Number of Lifestraws distributed	i	1024000
2	Adjustment for % alternative water treatment	X_{boil}	71.0%
3	Usage of water treatment systems in place	U_y	83%
4	Nonrenewable Biomass %	X_{nrb}	65%
5	Treated water per person/day (l/day)	L_{bl}	4.11
6	Liters of water still boiled (l/day)	L_{pj}	0.00
7	Wood used to boil 1 liter water (kg/l)	W_i	0.36
8	Members per LifeStraw®	P_i	4
9	Project biomass consumption per year (t/yr)	B_{pj}	266996
10	CO2 emission factor for wood (tonnes/TJ)	$EF_{\text{bl,bio,co2,net}}$	112
11	Net Calorific Value (NCV) of wood (TJ/t)	NCV	0.0156
12	CO2 emission factor for wood (tonnes/t)	$EF_{\text{bl,bio,co2}}$	1.7472
13	CH4 emission factor for wood (tonnes/TJ)	$EF_{\text{bl,bio,ch4,net}}$	1.224
14	GWP CH4		21
15	CH4 emission factor for wood (tonnes/t)	$EF_{\text{bl,bio,ch4}}$	0.4009824
16	N2O emission factor for wood (tonnes/TJ)	$EF_{\text{bl,bio,n2o,net}}$	0.01125
17	GWP N2O		310
18	N2O emission factor for wood (tonnes/t)	$EF_{\text{bl,bio,n2o}}$	0.054405
19	Project emissions (tCO2e/yr)	PE	424,808

Finally, the estimated emission reductions are calculated as shown by the equations presented in B.6, as Baseline Emissions – Project Emissions – Leakage Emissions. These numbers are presented in the following table.

**B.6.4 Summary of the ex-ante estimation of emission reductions:****Table 5: Annual ex-ante emission reduction estimate**

Year	Estimation of Project Activity Emissions (tCO ₂ e)	Estimation of baseline emissions (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of overall emission reductions (tCO ₂ e)
2011	424,808	2,498,872	736	2,073,328
2012	424,808	2,498,872	736	2,073,328
2013	424,808	2,498,872	736	2,073,328
2014	424,808	2,498,872	736	2,073,328
2015	424,808	2,498,872	736	2,073,328
2016	424,808	2,498,872	736	2,073,328
2017	424,808	2,498,872	736	2,073,328
2018	424,808	2,498,872	736	2,073,328
2019	424,808	2,498,872	736	2,073,328
2020	424,808	2,498,872	736	2,073,328
Total (tonnes of tCO ₂ e)	4,248,083	24,988,723	7,360	20,733,280

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

The monitoring methodology used is presented in page 36 of the selected methodology. Each of the parameters required are presented in the following tables, along with the appropriate monitoring plan.

B.7.1 Data and parameters monitored:

Data / Parameter:	$X_{nr,b,y}$
Data unit:	Fraction
Description:	Non-renewability of woody biomass fuel in year y in baseline scenario
Source of data to be used:	Study
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0.65
Description of measurement methods and procedures to be applied:	Reference section B4, Non-Renewable Biomass.
QA/QC procedures to be applied:	3 rd party study and report
Any comment:	No less than biennial monitoring frequency



Data / Parameter:	$X_{nr,p,y}$
Data unit:	Fraction
Description:	Non-renewability of woody biomass fuel in year y in project scenario
Source of data to be used:	Study
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0.65
Description of measurement methods and procedures to be applied:	Reference section B4, Non-Renewable Biomass.
QA/QC procedures to be applied:	3 rd party study and report
Any comment:	No less than biennial monitoring frequency

Data / Parameter:	i_y
Data unit:	Units/year
Description:	Number of LifeStraw® units distributed
Source of data to be used:	Database review
Value of data applied for the purpose of calculating expected emission reductions in section B.6	1,024,000
Description of measurement methods and procedures to be applied:	In order to reach every family in the Western Province, the target population for the distribution is approximately 80% of women between 15 and 64. Based on current population estimates, this is a total of, conservatively, 1,024,000 people. ²⁴
QA/QC procedures to be applied:	Review of total customer database.
Any comment:	

Data / Parameter:	LE_y
Data unit:	tCO ₂ e/y
Description:	Leakage; potential GHG emissions outside project boundary caused by project activity
Source of data to be used:	Calculated based on methods presented in PDD and data collected from total sales record of LifeStraw® Family units produced and distributed.
Value of data applied for the purpose of calculating expected	736

²⁴ Population Projections for Kenya 2000-2020 (Revised), DHS



emission reductions in section B.6	
Description of measurement methods and procedures to be applied:	The Total Sales Record will record the number of LifeStraw® Family units produced and distributed, and the calculations presented in section B.4, Leakage, will be applied to determine the ex-post leakage emissions.
QA/QC procedures to be applied:	Spot checks by 3 rd party of total sales record.
Any comment:	Leakage will be applied ex-post as the Total Sales Record is updated, and applied prior to each verification. The calculation methodology described will be reviewed with biennial monitoring frequency.

Data / Parameter:	$B_{b,i,y}$
Data unit:	Tonne/year
Description:	Mass of woody biomass combusted in the baseline in year y
Source of data used:	Calculation
Value of data applied for the purpose of calculating expected emission reductions in section B.6:	Please reference section B.6.3, Table 3 Table 3 , line 7.
Description of measurement methods and procedures to be applied:	Calculated per the methodology (page 35) as shown in section B.4.
QA/QC procedures to be applied:	Calculation
Any comment:	No less than biennial monitoring frequency

Data / Parameter:	$B_{p,i,y}$
Data unit:	Tbiomass/y
Description:	Mass of woody biomass combusted in the project in year y
Source of data to be used:	Calculation
Value of data applied for the purpose of calculating expected emission reductions in section B.6	Please reference section B.6.3, table 4, line 9.
Description of measurement methods and procedures to be applied:	Calculated per the methodology (page 35) as shown in section B.6.
QA/QC procedures to be applied:	Calculation



Any comment:	No less than biennial monitoring frequency
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Data / Parameter:	U_y
Data unit:	Percentage
Description:	Usage of water treatment units in place
Source of data to be used:	Usage Survey
Value of data applied for the purpose of calculating expected emission reductions in section B.6	83%. An independent study of the pilot campaign indicated that 83% of users surveyed were using their LifeStraw® unit after the pilot campaign ²⁵ . The project proponent plans to expand on education efforts to increase uptake.
Description of measurement methods and procedures to be applied:	A random survey will be conducted of LifeStraw® Family users, in which they will be asked to demonstrate the use of the LifeStraw®. By demonstrating use of the unit, two requirements are accomplished: Successful demonstration is indicative of frequent use, and will also demonstrate that the unit is, “used and maintained in accordance with the manufacturer's instructions” in order to demonstrate proper performance in reference to the F_y parameter discussed below.
QA/QC procedures to be applied:	Spot checks by 3 rd party.
Any comment:	No less than biennial monitoring frequency

Data / Parameter:	W_i
Data unit:	Kg/L
Description:	New stove performance and existing stove performance
Source of data to be used:	Baseline Water Boiling Test (BWBT) Kitchen Test
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0.36 - Determined via baseline water boiling tests (see Annex 3).
Description of measurement methods and procedures to be applied:	Reference Annex 3, Baseline Information, Baseline Water Boiling Test (BWBT)
QA/QC procedures to be applied:	Reference Annex 3, Baseline Information, Baseline Water Boiling Test (BWBT)
Any comment:	Will be conducted only if the Kitchen Test reveals that the baseline water boiling conditions have changed, necessitating a new BWBT.

²⁵ De Ver Dye, T., Apondi, R., Lugada, E., Kahn, J., Sandiford-Day, M., DasBanerjee, T., ““You can take water any place you are:” A Qualitative Assessment of Water-related Illness Beliefs, Behaviors, and Community Acceptance of Novel Personal Water Filtration Devices,” Department of Public Health and Preventive Medicine, Institute for Human Performance, SUNY Upstate Medical University, 2009



Data / Parameter:	$L_{b,i,y}$
Data unit:	L/p/d
Description:	Liters of treated water in the baseline
Source of data to be used:	Kitchen Survey
Value of data applied for the purpose of calculating expected emission reductions in section B.6	<p>4.11</p> <p>Each LifeStraw® Family is capable of treating 18,000 liters. For an average family of 4, this translates to 4.11 liters/day/person over a 3 year period. The average family size is derived based on population data. While a baseline Kitchen Survey determined that the average family size was 6-7 people²⁶, in many instances these families include several women who will receive LifeStraw® Family units during the campaign.</p> <p>In order to reach every family in the Western Province, the target population for the distribution is approximately 80% of women between 15 and 64. Based on current population estimates, this is a total of, conservatively, 1,024,000 people.²⁷</p> <p>Population data for the Western Province indicated more than four million people. Therefore, the average number of people served by a LifeStraw® Family unit will be conservatively 4.</p>
Description of measurement methods and procedures to be applied:	<p>The methodology states that this parameter is “the total amount of treated water for consumption per person per day (in liters). This is equal to the amount of raw water treated plus the amount of raw water boiled after the introduction of the water treatment technology”.</p> <p>These two elements of this parameter are therefore estimated as follows:</p> <p>The amount of raw water treated will be collected by monitoring survey, in which respondents are surveyed on the amount of water treated with the LifeStraw® Family per day. <u>The water counted will include all water treated including for drinking, human washing, and food washing, consistent with the revised methodology, page 35, footnote 46, “Technologies and Practices to Displace Decentralized Thermal Energy Consumption”. The total amount of water treated and credited for carbon emission reductions calculations shall include drinking, food and human washing water, subject to a cap of 7.5 liters per person per day.</u></p> <p>The amount of raw water boiled will also be collected during the Kitchen Survey, when residents will be asked if they currently boil water for consumption other than cooking. If yes, the volume of water boiled per family will be recorded. This value will then be divided by the parameter $P_{i,y}$, discussed below, to account for the number of people in each household.</p> <p>This parameter will first be updated prior to the first verification by Kitchen Tests</p>

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Comment [E1]: Revision based on revised methodology

²⁶ SUSTAINABLE DEPLOYMENT OF THE LIFESTRAW® FAMILY IN RURAL KENYA, Kitchen Survey - Sample size-115 households, 5 questionnaires were administered per district in the 23 districts, August 1, 2010, EXP www.expagency.biz

²⁷ Population Projections for Kenya 2000-2020 (Revised), DHS



	that will be conducted over a period of three days in a sample of at least 30 households. The average values from each of three readings from these households will then be statistically analyzed with a 90% confidence interval, and the lower bound of the 90% confidence interval will be taken as the baseline value.
QA/QC procedures to be applied:	Spot checks by 3 rd party.
Any comment:	No less than biennial monitoring frequency. This value will be capped at 7.5, per page 35 of the methodology.

Data / Parameter:	$L_{p,i,y}$
Data unit:	L/p/d
Description:	Liters of treated water still boiled in the project activity
Source of data to be used:	Kitchen Survey
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0 An education campaign during deployment and monitoring of the LifeStraw® Family will strongly encourage residents to use the unit in place of boiling water for treatment. Therefore, it is assumed that residents who properly adopt the LifeStraw® Family and are using the unit appropriately, as monitored by the U_y parameter, will appropriately avoid boiling water for treatment. This parameter will first be updated prior to the first verification by Kitchen Tests that will be conducted over a period of three days in a sample of at least 30 households. The average values from each of three readings from these households will then be statistically analyzed with a 90% confidence interval, and the lower bound of the 90% confidence interval will be taken as the baseline value.
Description of measurement methods and procedures to be applied:	The amount of treated water boiled and raw water boiled will be collected during the monitoring survey, when residents will be asked if they currently boil water for consumption other than cooking. If yes, the volume of water boiled per family will be recorded. This value will then be divided by the parameter $P_{i,y}$, discussed below, to account for the number of people in each household.
QA/QC procedures to be applied:	Spot checks by 3 rd party.
Any comment:	No less than biennial monitoring frequency.

Data / Parameter:	$P_{i,y}$
Data unit:	p/h
Description:	Average people per LifeStraw® Family unit
Source of data to be used:	Monitoring Survey and Study
Value of data applied	4 - The average family size is derived based on population data. While a baseline



for the purpose of calculating expected emission reductions in section B.6	<p>Kitchen Survey determined that the average family size was 6-7 people²⁸, in many instances these families include several women who will receive LifeStraw® Family units during the campaign.</p> <p>In order to reach every family in the Western Province, the target population for the distribution is approximately 80% of women between 15 and 64. Based on current population estimates, this is a total of, conservatively, 1,024,000 people.²⁹</p> <p>Population data for the Western Province indicated more than four million people. Therefore, the average number of people served by a LifeStraw® Family unit will be conservatively 4.</p> <p>Because a wide age range of women is served, some families will receive more than one LifeStraw® Family unit. Therefore, these larger families will be accounted for by the overall number of LifeStraw® Family units distributed and number of people served.</p>
Description of measurement methods and procedures to be applied:	During the random sample monitoring surveys, residents will be asked how many LifeStraw® Family units the family has, and how many people are in their family, served by the LifeStraw® Family units.
QA/QC procedures to be applied:	Spot checks by 3 rd party.
Any comment:	No less than annual survey.

Data / Parameter:	X_{boil}
Data unit:	Fraction
Description:	Percentage of users that would boil water as a form of water treatment
Source of data to be used:	Baseline Study
Value of data applied for the purpose of calculating expected emission reductions in section B.6	<p>0.71</p> <p>Fraction of population boiling or would boil in the baseline (X_{boil})</p> <p>The project proponent will only claim emission reductions for residents who currently boil, or would boil their water if barriers were reduced, in the baseline. The project proponent sought clarification from the Gold Standard on how to determine this factor from the Chair of the GS Technical Advisory Committee, as well as the GS Deputy Technical Director. In response, the project proponent was provided with this guidance from the GS Deputy Technical Director:</p> <p>A scenario was outlined wherein:</p> <p>”Some households in target area drink untreated water, some drink boiled water and remaining drink water treated by other techniques in pre-project scenario.”</p>



	<p>"In this scenario I think that households that drink untreated water and those that drink boiled water in pre-project scenario will form part of different clusters. Households that drink water treated by other techniques will not form part of the project activity. The PP can potentially use BWBT from households that drink boiled water in pre-project scenario and apply it to households that drink untreated water. Again these two clusters can be merged making conservative assumption.</p> <p>This merging does not lead to conservative emission reductions but given the suppressed demand aspect this deviation can be accepted. Further, as you suggested, PP should assume same proportion of households drinking untreated water to shift to drinking boiled water as is the proportion between households drinking boiled water & those drinking water treated by other techniques in Target Area."</p> <p>The project proponent therefore designed the emission reduction calculations precisely as outlined. The project proponent has merged the two clusters of end-users who boil in the pre-project scenario with the people who currently do not boil but WOULD boil if resources were provided. And the project proponent has excluded end-users who currently use alternative forms of treatment or WOULD if resources were available. Therefore, the project as presented is consistent with the guidance provided by the Gold Standard authorities.</p> <p>To determine this population fraction parameter, 17 data collection surveys were conducted across 9 districts in the western province. These results indicated that between 71% and 82% of the people in the region either currently boil drinking water, or would boil it if resources were more readily available.³⁰</p> <p>Therefore, the project proponent will use the most conservative value for the baseline: $X_{\text{boil}} = 0.71$</p> <p>The project proponent will directly monitor this parameter.</p>
Description of measurement methods and procedures to be applied:	During the random sample monitoring surveys, residents will be asked to what their preferred method of providing clean water would be, if the LifeStraw® Family unit were not available. Residents who answer with alternative treatment options other than boiling with biomass will be discounted proportionally from emission reduction claims through the X_{boil} parameter.
QA/QC procedures to be applied:	Spot checks by 3 rd party.
Any comment:	No less than biennial monitoring frequency. This survey will be expanded to no less than 100 samples prior to the first annual verification of this project.

Data / Parameter:	$AF_{\text{pl,i,y}}$
Data unit:	T _{fuel} /year
Description:	Alternative fuel consumed in the project
Source of data used:	Monitoring Survey and Study

³⁰ EXP Agency, Mini-survey-results.xls, September 10, 2010



Value of data applied for the purpose of calculating expected emission reductions in section B.6	0
Description of measurement methods and procedures to be applied:	During the random sample monitoring surveys, residents will be asked to provide the nature and volume of alternative fuels that WOULD be used in the absence of the project activity.
QA/QC procedures to be applied:	Spot checks by 3 rd party.
Any comment:	No less than biennial monitoring frequency.

B.7.2. Description of the monitoring plan:

The monitoring plan for this project is closely derived from the methodology. A Total Sales Record, Detailed Customer Database, and Project Database will be maintained continuously, while periodic KS's and KT's will be performed to measure or estimate parameter values and review and revise the cluster lists held in the Project Database. Emission reduction calculations are carried out on the basis of the KT results.

The monitoring tasks undertaken continuously are:

1. Maintenance of a Total Sales Record

In the case of this project, the LifeStraw® Family units will not be sold to residents, rather they will be given away as part of an integrated health campaign. Therefore, as applicable to this project, the Total Sales Record will consist of a record of all LifeStraw® Family units distributed. The data included will be:

- Date of Distribution
- Location of Distribution
- Mode of use: (assumed domestic)
- Model/type of LifeStraw® Family distributed
- Number of LifeStraw® Family units distributed
- Name and telephone number (if available)
- Address (if feasible)

2. Maintenance of a Detailed Customer Database, and Monitoring KS's

The project proponent will place the results of Kitchen Surveys into a Detailed Customer Database (DCD). The DCD will initially be filled with the results of the Baseline KS (and may be supplemented with additional data collected during the baseline Kitchen Tests); and will then be further populated by data collected during the course of the project by Monitoring KS's and Monitoring KT's.



Periodic Monitoring Tasks will be undertaken in accordance with the Methodology. The periodic monitoring tasks will use the same survey requirements that the Monitoring Kitchen Survey method would otherwise require. This is as follows:

At least 50% of the Periodic Monitoring Surveys will be conducted in person with at least 25 surveys for each cluster. A random sample will be drawn from the Sales Record. The monitoring surveys will include the following questions, and will be conducted at least biennially:

- Address and/or telephone number (when feasible)
- Type of water treatment technology in home, location and application and use
 - Place of use of the LifeStraw® Family
 - Description of use of the LifeStraw® Family
 - Approximate amount of water treated daily
- Baseline kitchen regime to identify the baseline behavior or pre-project activity water treatment method.
- Fuel types used in the home
- Fuel mix used in the home
- Wood-fuel collection / purchase time, cost and effort required
- Fuel trends – increasing or decreasing cost and / or collection time
- Stove time used in the home to boil water in the pre-project scenario
- Number of people living in the household

Other periodic monitoring tasks required by the methodology will be conducted as follows:

- Non-renewable biomass: Reassessment of X_{nr} fraction completed every second year.
- Leakage: Measurements for potential leakage effects completed every second year.
- Usage survey: to assess the usage rates for water treatment units. This will be completed every second year.
- Performance Survey: to check whether water treatment units continue to meet the specifications stated by the manufacturer. This will be assumed to be an ex-ante factor, based on manufacturer guarantee after residents demonstrate appropriate use of the technology.

3. Continuous updating of the Project Database

The Project Database will be derived from the Total Sales Record, dividing the residents into groups according to the most recent definition of clusters, and listing under separate headings any distributions which do not fall into the cluster categories. The Project Database will include a description of the conclusions of KS's and KTs with regard to clustering, factors affecting emission reductions, and adjustments for emission reduction calculations and it should include within it the emission reduction calculations for the project.

4. Calculation of emission reductions

Emission reductions will be calculated using the results of the most recent survey data. The surveys and tests will provide updated values for NRB fraction, Leakage, and also values for Usage factors, always specific to a cluster. The updated NRB and Leakage values adjust all emission reduction results for the year monitored.



See also Annex 4 for additional information.

Quality Assurance and Quality Control

An expert 3rd party will be employed to perform some of the monitoring tasks, and to spot check the monitoring results reported. Given the length and complexity of the project, the project proponent may employ different 3rd parties for varying tasks throughout the project lifetime. In order to ensure appropriate quality assurance and quality control, the project proponent will commit to having some monitoring tasks and spot checking performed by a 3rd party during every monitoring interval, and will appropriately report results to the verifying party.

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

Date of completion of the application of the baseline study and monitoring methodology: January 2011.

Alison Hill, Vestergaard S.A., ahh@vestergaard-frandsen.com, +1 571 527 2180

Evan Thomas, Manna Energy Limited, evan.thomas@mannaenergy.com, +1 303 550 4671

SECTION C. Duration of the project activity / crediting period

10 years from the date of deployment of the first LifeStraw® Family unit.

C.1. Duration of the project activity:**C.1.1. Starting date of the project activity:**

Estimated April 2011. Actual start date will be reported to Gold Standard.

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

10 years

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

10 year fixed crediting period.

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

Estimated April 2011. Actual start date will be reported to Gold Standard.

C.2.2.2. Length:



10 years.

SECTION D. Environmental impacts

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

Environmental impacts are not expected to be significant for the project activity. No transboundary impacts are anticipated. An EIA is not required for voluntary carbon finance projects in Kenya. However, the project proponent is working with the Kenya Bureau of Standards and other relevant governmental bodies to ensure that the LifeStraw® Family products meet all applicable Kenya laws.

Furthermore, discussions were held during stakeholder consultations regarding potential environmental impacts. Stakeholders, including representatives of National Environmental Management Authority of Kenya, expressed the opinion that the environmental outcome of the project would be beneficial. However, there were questions raised about the proper disposal of the LifeStraw® Family units during the replacement phase. The project proponent anticipated this concern, and takes this point very seriously.

Though environmental harm was not rated a negative in the final sustainable development matrix and thus does not require mitigating measures, the project proponent nonetheless is implementing alterations to the project based on stakeholder consultation comments, and will monitor environmental effects and disposal over time:

- LifeStraw® Repair Centers will be established in the region accessible to people in every district.
- Personnel will be trained at each center to ensure proper disposal and that repairs and replacements are completed when necessary.
- In order to receive a replacement, users will be required to return their expended LifeStraw® Family unit before a new one issued.
- Vestergaard will then recycle or dispose of the expended units in accordance with Kenya laws and regulations.

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

NA

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

The stakeholder consultations were announced in several ways. First, a full list of potential stakeholders was compiled by the project participants that included government officials, non-governmental organizations (NGOs) (including local and International Gold Standard Supporter NGOs), multilateral development organizations and companies currently engaged in relevant project sectors. For those stakeholders that had email addresses, invitations were sent via email. This letter is included in the Gold



Standard Local Stakeholder Consultation Report. Many participants were also invited by phone and personal visits, including household immersions in each district. The invitation was also publically advertised by poster in district centers in both Swahili and English (a copy of the poster is also included in the Gold Standard Local Stakeholder Consultation Report).

Prior to the physical stakeholder consultation meeting, stakeholders were encouraged to provide input, questions or comments through email, calling or sending letters. Although it was explained in the announcements and invitation letter that it is possible to comment on the project by sending email or phone call, no feedback, comments or questions were received as a result of these announcements. This was anticipated by local staff, as the culturally appropriate venue for comments was through the in-person meetings.

Comment boxes were posted at central locations in each of the 23 districts (planned based on Government of Kenya re-zoning, as of initial planning there were 19 districts) to allow those not able to attend the physical stakeholder meeting to provide input on the project. The comment boxes and posters include a non-technical summary and contact information of local Vestergaard S.A. staff for local stakeholders to find out more information if so desired. The comment boxes will remain posted through the stakeholder feedback round to allow adequate time for input on the project.

Recognizing that conducting the stakeholder consultation in the district capital around a product that is aimed at peri-urban and rural households and that disproportionately affects women over men, the project proponent conducted 115 immersions in homes of each of the 23 (planned) districts (5 homes in each district) that will be included under the project.

Three formal stakeholder consultation meetings were carried out. An initial meeting took place in on July 21, 2010 and two main stakeholder consultation meetings took place on July 24, 2010, all in Kakamega, the capital of the Western province and central location to the project boundary.

The meetings were attended by representatives from government, environmental and non-governmental organizations, academia and the private sector from each of the 23 (planned) districts in the project boundary. There were 20 participants in the first meeting, 67 in the first session of the main meeting and 56 participants in the second session of the main meeting.

The combination of formal meetings in Kakamega and household immersions with women in their homes proved to be an effective method of gaining a broad spectrum of potential people who have an interest in or could be affected by the project.

All stakeholder comments have been compiled and accounted for in the Gold Standard Local Stakeholder Consultation Report and Gold Standard Passport.

E.2. Summary of the comments received:

In general, the assembled stakeholders expressed overwhelming support for the project, and expressed appreciation that the project would deliver co-benefits beyond greenhouse gas reduction, as follows:

- The project will significantly reduce waterborne diseases;
- The project will help reduce cutting of trees;



- It will relieve the girl children and mothers from collecting firewood and the hassle of boiling water;
- Improvement in indoor air quality, leading to reduced risk of ill-health in women and children
- It will help alleviate poverty arising from reduced fuel consumption and costs;
- It will provide beneficial employment to local Kenyans during distribution, monitoring and replacement phases of the project.

The primary comments and recommendations made by the stakeholders were:

1. Educate consumers not only on product usage and benefits but also how to take care of the filters.
2. Ensure proper disposal of the LifeStraw® Family filters after the three-year life-span to avoid potential negative effects to the environment.
3. Expand project to other parts of Kenya, so that the project benefits and carbon financing has the effect of reaching as many people as possible.
4. That this project platform is used to improve other environmental concerns such as fuel wood harvesting and charcoal production practices.
5. The meetings fully endorsed the project and concluded that carbon financing is necessary funding to sustain the project.

In addition to uploading the stakeholder consultation report in English to the Gold Standard registry, a summary of this report was translated into Swahili and made available at Vestergaard Franden's Nairobi office. Additionally, the response to Stakeholder concerns was presented to community leaders during subsequent meetings, including during the Validation Site Visit. No further concerns have been raised since the initial Stakeholder Consultation Round.

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

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Several participants raised concern on the lifespan of LifeStraw® Family water filters and the type of water that could be filtered. Key to the discussion was questions on whether the water filter contained any chemicals and if these were harmful to users.	Yes	Facilitators clarified that the source of water will not affect the quality of water after purification from the LifeStraw® Family unit and that the unit should last for a period of 3 years depending on the turbidity of water being purified. The facilitators clarified that the units do not remove chemical contamination from the water and are only meant to purify the water from microbiological contamination. Technical concerns regarding the water filter were also addressed and participants were taken through Ultra-filtration process and the outcome of field studies on the product. Participants were however advised to ensure that they use the best available water when filtering and to make sure that they do not use water that has already been



		<p>used for other purposes like washing clothes.</p> <p>It was further clarified to some stakeholders that the unit does contain a chlorine chamber that prevents biological fouling of the filter. The active chlorine elution is below the US EPA MCL of 4 mg/L, and does not leave any residual taste or odour in the water.</p>
Several participants raise questions about sustainability of the project. For example, a participant felt that there had been a number of projects initiated in the past and the community was left without a clear way forward once the project came to an end. Several participants wanted to know what would happen after 10 years.	Yes	Facilitators responded that the sustainability of the project will depend on how well the community will adopt the use of LifeStraw® Family as carbon financing will be in the form of sustainable financing to the project. Facilitators highlighted the difference between carbon financed projects and traditional development programs. Where funding source for traditional projects may run out after a few years, the carbon project has a 10 year lifespan which is unprecedented in development. However, it was reiterated that in order for the project to be sustained, usage must be demonstrated. Mr. Otieno suggested that by the end of the 10-year period there could be local manufacturing of the LifeStraw® Family units and that the repair centers could be self-sustaining by that point or small businesses may develop around the product.
Several participants commented that it was important to educate consumers not only on product usage and benefits but also how to take care of the filters.	Yes	Community education will comprise a big part of the campaign. With respect to LifeStraw® Family education will not only focus on benefits but also on how the filter should be used. Follow up will be done after the distribution to determine level of usage of LifeStraw® Family. Repair centers and trained personnel will be made available in districts to ensure the community gets more education on LifeStraw® Family and repairs and replacements done when need arises and the repairs and replacements will be free of charge.
Participants were interested in knowing whether carbon finance was a reality, how the community would benefit from Carbon Finance and who would manage the credits.	Yes	The facilitators explained that Vestergaard Frandsen has the responsibility of managing the carbon credits and that evaluation are done on an annual basis. In order for the project to be sustained, usage must be demonstrated. Mr. Otieno simplified the whole idea of carbon financing by drawing similarities between this and loyalty cards given out by Supermarkets. The points given through the cards were not cash based but were redeemed through purchase of



		items from the supermarket. In the same vein, carbon credits would not be in cash but will entitle the community to the project by ensuring that LifeStraw® Family was available, maintained and could be replaced after 3 years. Revenue from the carbon credits will be used to buy new LifeStraw® Family filters.
Several participants express concerns and identified a risk of the possible littering of old units and the negative effects to the environment that could result if the replacement of the water filters was not handled properly after the three-year life-span.	Yes	This concern is taken very seriously. Repair centers and trained personnel will be made available in districts to ensure repairs and replacements are done when need arises. In order to receive a replacement, Vestergaard will require the expended LifeStraw® Family unit to be turned in before a new one issued. Vestergaard Frandsen will then recycle the expended units in accordance with local regulations.
Participants asked the outcome of the 2008 IPD campaign, whether there are studies to support claims that LifeStraw® Family is effective and the level of success of LifeStraw® Family as a product.	Yes	Studies have been undertaken on IPD in relation to health and cost effectiveness of the campaign – the integrated approach makes it cost effective. Several studies have been done showing the LifeStraw® Family unit high quality ultra-filtration mechanism is 99.99% effective in reduction of protozoa, bacteria and viruses and complies with U.S. Environmental Protection Agency guidelines for microbiological water quality ³¹ . Additionally, an independent study of the pilot campaign indicated that 83% of users surveyed were using their LifeStraw® unit after the pilot campaign ³² . The project proponent plans to expand on education efforts to increase uptake.
Other environmental concerns were raised with several participants who expressing the view that even though the current focus was on boiled water, use of carbon for cooking was also another environmental hazard and so communities should be educated on alternative fuel.	No	Though Vestergaard Frandsen shares the concerns of the participants regarding other environmental issues, it is beyond the scope of the project and NEMA is better suited to educate communities on environment and alternative fuels.
A participant asked if there would be enough LifeStraw® Family to meet demand generated during the campaign.	Yes	Vestergaard intends to target 1 million families during this campaign and if successful hopes to expand the campaign throughout the country.

³¹ Vestergaard Frandsen LifeStraw® Family Overview Presentation, 2010

³² De Ver Dye, T., Apondi, R., Lugada, E., Kahn, J., Sandiford-Day, M., DasBanerjee, T., “‘You can take water any place you are:’ A Qualitative Assessment of Water-related Illness Beliefs, Behaviors, and Community Acceptance of Novel Personal Water Filtration Devices,” Department of Public Health and Preventive Medicine, Institute for Human Performance, SUNY Upstate Medical University, 2009

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Vestergaard S.A.
Street/P.O.Box:	Chemin de Messidor 5-7
Building:	CH – 1006
City:	Lausanne
State/Region:	
Postcode/ZIP:	
Country:	Switzerland
Telephone:	+41 (0) 21 310 7333
FAX:	+41 (0) 21 310 7330
E-Mail:	aah@vestergaard-frandsen.com
URL:	http://www.vestergaard-frandsen.com
Represented by:	Alison Hill
Title:	Global Health Policy Advisor, c.s.
Salutation:	Ms
Last name:	Hill
Middle name:	Ann
First name:	Alison
Department:	
Mobile:	+15712777290
Direct FAX:	+1 703 997 3235
Direct tel:	+15712777290
Personal e-mail:	aah@vestergaard-frandsen.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is anticipated for this project. If funding circumstances change, the Gold Standard will be notified promptly.

**Annex 3****BASELINE INFORMATION**

See Section B.6 of this document, as well as the information presented below.

Baseline Water Boiling Test (BWBT)

Page 37 of the selected methodology requires a Kitchen Test consisting exclusively of a Baseline Water Boiling Test (BWBT) to establish W_i parameter of kilograms of fuel required to boil a litre of water. The complete text states:

“Baseline Water Boiling Test (BWBT): to find the amount of wood-fuel or alternative fuel required in kg/L to bring one litre of water to boil (W_i) on stove type i and to be safe for consumption. In order for the test to be consistent across stove types this shall be completed in a laboratory. In order to reflect an evolving baseline the BWBT should be updated when new stove and fuel types are monitored. This should be monitored ex post.”

The project proponent contracted an expert social mobilization firm to conduct a rigorous Kitchen Survey that established the types of stoves used for water boiling in the baseline. Per page 7 of the baseline, for a group size of greater than 1,000, the sample size was required to be at least 100. A total of 115 surveys were conducted across 23 districts in the Western Province in Kenya³³.

This Kitchen Survey established that the predominant prevailing practice for stove use is on a 3-stone fire, with over 76% of respondents using this stove. The remaining stoves used were charcoal and paraffin. Results are shown in the following table:

Table 6: Stove used and frequency of use

	ordinary charcoal	3 stone	paraffin	Total
Total	16	88	11	115

The project proponent then conducted the BWBT in field laboratory tests to establish the W_i parameter. A sample size of 30 random households was used in 7 different districts. When respondents were asked specifically on stove and fuel use when boiling water for drinking consumption, the predominant stove remained three-stone fire, at 90% use, while the fuel use was 100% biomass; the field laboratory testing established that an insignificant number of people use fuels other than biomass for water treatment. Therefore, the BWBT were conducted entirely with typical biomass used by respondents. The results of the BWBT survey are shown below:

Table 7: Stoves used for water boiling

	Three stone	Other	Total
Stoves used for boiling water	27	3	30

³³ SUSTAINABLE DEPLOYMENT OF THE LIFESTRAW® FAMILY IN RURAL KENYA, Kitchen Survey - Sample size-115 households, 5 questionnaires were administered per district in the 23 districts, August 1, 2010, EXP www.expagency.biz

**Table 8: Fuel used for water boiling**

	Biomass	Other	Total
Fuel used for boiling water	30	0	30

In order to meet the intent of the caveat that, “In order for the test to be consistent across stove types this shall be completed in a laboratory”, the project proponent conducted field laboratory testing, with a protocol developed to be consistent with the BWBT description. Field laboratory testing with calibrated instruments was deemed appropriate, as the most significant parameter of interest is fuel consumed per litre of water boiled under typical cooking conditions in Western Province, Kenya. This is consistent with other data collection done in developing communities. For example, in “Prospective Community Studies in Developing Countries” the authors state that, “The term “population laboratory” has been used to describe field sites which demographers use to study population dynamics”³⁴.

This approach is also supported by the expert developers of the Shell Water Boiling Test, Kitchen Performance Test and the Controlled Cooking Test, who have stated that to gain data relevant to local conditions, field laboratory tests should be conducted with household respondents in the field.³⁵

The project proponent therefore developed a protocol calling on field laboratory subjects to boil water as typical conducted at the home. The only additional instruction was to allow the water to boil for 5 minutes after reaching the boiling point, in order to ensure disinfection consistent with the intent of the methodology. This 5 minute figure is typical, and supported by several expert sources, including the following:

“Heat is of great importance. Exposure to moist heat at 100 C or 2212 F (ie. Boiling in water) kills bacteria in five to ten minutes but longer exposures to higher temperatures (eg. 15 minutes at 121C) are necessary to kill off resistant spores”³⁶.

“Some authorities recommend boiling water for 30 minutes to ensure complete disinfection. This can be quite wasteful of fuel, however, and boiling water for 5 minutes or less will typically give good results”³⁷.

“Turbid water should preferably be filtered through a clean cloth before boiling. Alternatively the water should be boiled for up to 5 minutes”³⁸.

The protocol was as follows:

1. Woman of household were asked to boil water using the same amount of fuel and water and same stove as they would normally.
2. Fuel (wood) tied and measured on digital scale and recorded and verified by picture prior to starting fire.
3. Water in pot measured using 1.5L measuring cup; amount recorded in liters.
4. Start time recorded at moment fire is lit (match struck).
5. Picture taken of stove.
6. Time recorded at roiling boil.

³⁴ Gupta, M., Aaby, P., Garenne, M., Pison, G., Prospective Community Studies in Developing Countries, Clarendon Press Oxford, 1997

³⁵ Bailis, R., The Controlled Cooking Test, Household Energy and Health Programme, Shell Foundation, 2007

³⁶ Howard, C., Black's Medical Dictionary, Rowman and Littlefield, 1990

³⁷ Markle, W., Fisher, M., Smego, R., Understanding Global Health, McGraw-Hill Professional, 2007

³⁸ Twort, A., Ratnayaka, D., Brandt, M., Water Supply, Butterworth-Heinemann, 2000



7. Boiling allowed to continue for 5 minutes after beginning of roiling boil.
8. Water temperature recorded just before end of 5 minute boil using clinical mercury thermometer
9. Time recorded at end of 5 minute boil.
10. Pot removed from fire and remaining wood and large coals moved aside to allow for cooling.
11. Remaining wood measured using digital scale and recorded and verified by picture.

The digital scale used was calibrated after every few tests using standard scale weights (200g and 500g); recorded by photo.

The results of the BWBT are shown in the following table.

Table 9: BWBT biomass fuel consumed per liter of water boiled (W_i)

	Three-stone	Other	Combined
Sample size	27	3	30
Average fuel consumption (kg/L)	0.36	0.31	0.36
Standard deviation (kg/L)	0.10	0.15	0.10
p-value	0.4378 – indicates no statistically significant difference ³⁹		

As show, there was no statistically significant difference between results on the three-stone stove versus the other stoves available. Therefore, the only appropriate figure to use for W_i is the overall average of 0.36 kg/L. Given the data collected indicating universal use of biomass for water treatment, and insignificant differences between stoves used, this combined average is applied for the entire population.

³⁹ GraphPad Software T-test calculator <http://www.graphpad.com/quickcalcs/ttest1.cfm?Format=SD>

**Annex 4****MONITORING INFORMATION**

See Section B.7 of this document as well as the information presented below.

Note that data collected for several of the survey parameters will be averaged to yield parameters used in the emission reduction calculations. For example, for “liters of treated water in the baseline”, “liters of treated water still boiled in the project activity” and “average people per LifeStraw® Family unit” parameters, data will be collected at each survey household and average to be applied for the calculation as follows.

Table 10: Example averaging of parameters derived from survey

	Survey	Number of LifeStraw® Units	Number of people in household	Average people per LifeStraw® unit	Liters of water treated per day	Liters of water treated per person per day	Liters of water still boiled	Liters of water still boiled per person per day
	1	1	4	4	20	5.00	2	0.5
	2	2	6	3	30	5.00	0	0
	3	1	5	5	40	8.00	1	0.2
	4	1	7	7	25	3.57	0	0
	5	2	4	2	35	8.75	3	0.75
Total	5	7	26	3.71	150	5.77	6	0.23
				$P_{i,y}$		$L_{bl,i,y}$		$L_{pj,i,y}$

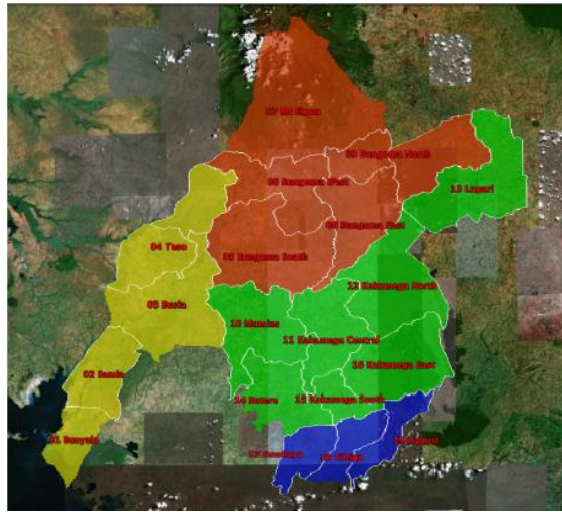


Annex 5

DISTRIBUTION SITE INFORMATION

The original distribution model proposed for the project activity, as described in the originally registered PDD and Passport, included a facility-based distribution using 687 sites across 19 districts of the Western Province of Kenya.

While the project boundary will remain the same, targeting the same population across the same 19 districts during the same timeframe, a change has been made to for the mode of deployment of the LifeStraw Family filters from a facility-based model to a door-to-door distribution model.



The decision to change the design was made for reasons related to ensuring a high-level of training and high-quality data collection while minimizing disruptions to the community. More specifically, working with community health workers at a household level rather than distributing through an external facilities allows us to:

1. Support families with the installation of the LifeStraw Family filters in their homes
2. Provide more comprehensive training and personalized education with more members of the family
3. Gather more precise and accurate data collection to build a stronger data base and allow more robust monitoring
4. Map, more accurately, recipient addresses to ensure accessibility of replacement and repair shops.
5. Minimize disruptions to schools, clinics or community centers in which the original distribution was planned.

Comment [E2]: Revised per memo dated March 3, 2011, and as accepted by Gold Standard to revise deployment method and site locations to household by household distribution

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District ID	District Name	Site ID	Site Code	Site Name	Site Type	Latitude	Longitude
1	Bunyala	1	A01001	Port Victoria	Sub-District Hospital/Ccc	0.09703	33.97586
1	Bunyala	2	A01002	Budalangi	Dispensary	0.13055	34.02778
1	Bunyala	3	A01003	Sisenye	Dispensary	0.14121	34.01444
1	Bunyala	4	A01004	Sirimba	Mission Dispensary	0.14435	34.05834
1	Bunyala	5	A01005	Mukhobola	H/C; CCC	0.08166	34.02995
1	Bunyala	6	A01006	Rukala	Dispensary	0.05638	33.99227
1	Bunyala	7	A01007	Mau-Mau	Shopping Centre	0.07069	33.98925
1	Bunyala	8	A01008	Makunda	Sec-School	0.08732	34.02248
1	Bunyala	9	A01009	Bulemia	Shopping Centre	0.11475	34.00094
1	Bunyala	10	A01010	Nabengele	Shopping Centre	0.15934	34.06269
2	Samia	11	A02011	Sio-Port	Dispensary	0.22512	34.2170
2	Samia	12	A02012	Agenga	Dispensary	0.25273	34.07073
2	Samia	13	A02013	Nangina	Dispensary	0.27736	34.09875
2	Samia	14	A02014	Namboboto	Dispensary	0.30428	34.09181
2	Samia	15	A02015	Nambuku	Dispensary	0.31829	34.11036
2	Samia	16	A02016	Kabuodo	Dispensary	0.30464	34.15932
2	Samia	17	A02017	Wakhungu	Dispensary	0.26889	0.13156
2	Samia	18	A02018	Ack-Funyula	Church	0.27712	34.11832
2	Samia	19	A02019	Buduta	Dispensary	0.22208	34.10933
2	Samia	20	A02020	Rumbiye	Dispensary	0.20378	34.09579
2	Samia	21	A02021	Namuduru	Dispensary	0.16726	34.09734
2	Samia	22	A02022	Nabuganda	Dispensary	0.17937	34.03769
2	Samia	23	A02023	Nanderema	Chiefs-Office	0.20491	34.06801
2	Samia	24	A02024	Busembe	Dispensary	0.1853	34.01623
2	Samia	25	A02025	Sio-Port	Dispensary	0.22511	34.02171
2	Samia	26	A02026	Agenga	Dispensary	0.25271	34.07073
2	Samia	27	A02027	Nangina	Dispensary	0.27736	34.09874
2	Samia	28	A02028	Namboboto	Dispensary	0.30431	34.09182
2	Samia	29	A02029	Nambuku	Dispensary	0.31828	34.11034



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2	Samia	30	A02030	Kabuodo	Dispensary	0.30459	34.15934
2	Samia	31	A02031	Wakhungu	Dispensary	0.26834	34.13161
2	Samia	32	A02032	Ack-Funyula	Church	0.27702	34.11828
2	Samia	33	A02033	Buduta	Dispensary	0.22208	34.10934
2	Samia	34	A02034	Rumbiye	Dispensary	0.20379	34.09577
2	Samia	35	A02035	Namuduru	Dispensary	0.16724	34.09731
2	Samia	36	A02036	Nabuganda	Dispensary	0.17936	34.03766
2	Samia	37	A02037	Nanderema	Chiefs Office	0.20511	34.06807
2	Samia	38	A02038	Busembe	Dispensary	0.18529	34.01623
3	Busia	39	A03039	Busia(Ampath)	Ccc	0.45993	34.10446
3	Busia	40	A03040	Trailer Park	Clinic	0.4638	34.09989
3	Busia	41	A03041	Tanaka	N.Home	0.45273	34.12466
3	Busia	42	A03042	Busia-GK Prison	Disp	0.4459	34.14502
3	Busia	43	A03043	Bukalama(New)	Disp	0.45067	34.18741
3	Busia	44	A03044	Nasira-ACK	Church	0.43124	34.20234
3	Busia	45	A03045	Busibwabe	Disp	0.41063	34.20117
3	Busia	46	A03046	Nambale	H/C	0.4558	34.2388
3	Busia	47	A03047	Segero-Catholic	Church	0.49981	34.26686
3	Busia	48	A03048	Lupida	H/C	0.57719	34.34256
3	Busia	49	A03049	Dulienge	School	0.56467	34.36181
3	Busia	50	A03050	Igara	Disp	0.53279	34.3632
3	Busia	51	A03051	Madibo-Ass-Chiefs'	Office	0.52508	34.38849
3	Busia	52	A03052	Khayo	Disp	0.51051	34.38895
3	Busia	53	A03053	Madende	Disp	0.4767	34.34653
3	Busia	54	A03054	Mungatsi-Ass-Chiefs'	Office	0.47074	34.31552
3	Busia	55	A03055	Your-Family	Clinic	0.41394	34.14665
3	Busia	56	A03056	Munongo	Disp	0.38101	34.12121
3	Busia	57	A03057	Mayenje-Ass-Chiefs'	Office	0.41876	34.10555
3	Busia	58	A03058	New-Busia-Bulanda	N.Home	0.45245	34.10208
3	Busia	59	A03059	Malanga	Disp	0.40361	34.29635
3	Busia	60	A03060	Lwanyange(New)	Disp	0.42945	34.27544
3	Busia	61	A03061	Buyende	School	0.38384	34.13527
3	Busia	62	A03062	Matayos Community	Clinic	0.36716	34.16359
3	Busia	63	A03063	Mabunge-Chiefs'	Office	0.40359	34.26197
3	Busia	64	A03064	St Claires-Kisoko	Disp	0.44926	34.28005
3	Busia	65	A03065	Nambale-REEP	Y.F.Centre	0.4514	34.2546
3	Busia	66	A03066	Nasewa	H/C	0.38601	34.23896
3	Busia	67	A03067	Matayos	H/C	0.35663	34.17151
3	Busia	68	A03068	Bumala "A"	H/C	0.29162	34.19205



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3	Busia	69	A03069	Busire ACK	Church	0.31014	34.19975
3	Busia	70	A03070	Bujumba	Disp	0.32255	34.2142
3	Busia	71	A03071	Burinda	Disp	0.30773	34.2215
3	Busia	72	A03072	Ikenzo	Disp	0.34385	34.22547
3	Busia	73	A03073	Namwitsula	School	0.36079	34.2098
3	Busia	74	A03074	Khunyangu(Ampath)	Ccc	0.33745	34.25792
3	Busia	75	A03075	Bumutiru	Disp	0.37618	34.26419
3	Busia	76	A03076	Sikoma ACK	Church	0.34421	34.27718
3	Busia	77	A03077	Bukhalalire	Disp	0.31826	34.27498
3	Busia	78	A03078	Butula REEP	VF-Centre	0.34136	34.33217
3	Busia	79	A03079	Butula-Miss	H/C	0.34208	34.33237
3	Busia	80	A03080	Sikarira	Disp	0.32417	34.3267
3	Busia	81	A03081	Masindabale	Disp	0.32557	34.37383
3	Busia	82	A03082	Musibiriri	Disp	0.34387	34.39288
3	Busia	83	A03083	Ogalo-Calvary	Church	0.36028	34.40425
3	Busia	84	A03084	Bumala "B"	H/C	0.39004	34.35003
3	Busia	85	A03085	Esibembe	School	0.40862	34.31508
3	Busia	86	A03086	Bwalire	Disp	0.37811	34.31705
4	Tese	87	A04087	Tdh	Hospital	0.62061	34.3453
4	Tese	88	A04088	Malaba-Dispensary	H/Facility	0.63626	34.28687
4	Tese	89	A04089	Kamurai H/C	H/Facility	0.66466	34.29915
4	Tese	90	A04090	Akichelesit Disp.	H/Facility	0.69134	34.34323
4	Tese	91	A04091	Angurai H/C	H/Facility	0.70932	34.35152
4	Tese	92	A04092	Abolei	H/Facility	0.65446	34.39331
4	Tese	93	A04093	Kolanya	H/Facility	0.70572	34.39703
4	Tese	94	A04094	Chemasir	H/Facility	0.73404	34.39334
4	Tese	95	A04095	Changara-Mission	H/Facility	0.73914	34.41626
4	Tese	96	A04096	Changara-Gok	H/Facility	0.75379	34.34804
4	Tese	97	A04097	Moding H/C	H/Facility	0.69166	34.3606
4	Tese	98	A04098	Kakapel	Pri. School	0.67512	34.35346
4	Tese	99	A04099	Awata-Market	Open-Market	0.64416	34.34434
4	Tese	100	A04100	Amagoro-Pri. School	School	0.62987	34.33146
4	Tese	101	A04101	Kamolo-Disp.	H/Facility	0.58754	34.29447
4	Tese	102	A04102	Malaba Ncbd	Cereal Board	0.63546	34.26804
4	Tese	103	A04103	Chelelemuk-Disp.	H/Facility	0.6206	34.34528
4	Tese	104	A04104	Amukura-Mission	H/Facility	0.572	34.27272
4	Tese	105	A04105	St. Pauls-Amukura	School	0.56854	34.27382
4	Tese	106	A04106	Amukura-Hospital	Hospital	0.56214	34.27325
4	Tese	107	A04107	Moru-Karisa	H/Facility	0.54767	34.20966



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4	Tese	108	A04108	Apokor	H/Facility	0.52905	34.28315
4	Tese	109	A04109	Kaliwa	School	0.51201	34.23469
4	Tese	110	A04110	Obekai	H/Facility	0.51166	34.20972
4	Tese	111	A04111	Ochude	H/Facility	0.47997	34.17626
4	Tese	112	A04112	Alupe Sub-District	H/Facility	0.49777	34.13047
4	Tese	113	A04113	Adungosi	Market	0.51542	34.15168
4	Tese	114	A04114	Chakol-Girls	School	0.5171	34.16316
4	Tese	115	A04115	Amaase	H/Facility	0.5233	34.17687
4	Tese	116	A04116	St. Marys' Pr-School	School	0.55237	34.17874
4	Tese	117	A04117	Lukolis	H/Facility	0.58262	34.20847
4	Tese	118	A04118	Fr. Okodoi	School	0.58498	34.21073
4	Tese	119	A04119	St. Mark-Ack Machakus	School	0.60759	34.23304
5	Bungoma South	120	B05120	Watoya-Mkt	Chiefs-Camp	0.45442	34.51867
5	Bungoma South	121	B05121	Kibachenje	Church	0.5197	34.49998
5	Bungoma South	122	B05122	Mateka-Mkt	D.O's-Office	0.53564	34.49701
5	Bungoma South	123	B05123	Lunakwe-Mkt	Church	0.52401	34.49751
5	Bungoma South	124	B05124	Nasianda	Disp	0.49915	34.45457
5	Bungoma South	125	B05125	Khulwanda	Disp	0.48144	34.41569
5	Bungoma South	126	B05126	Khasoko	H/C	0.48408	34.40223
5	Bungoma South	127	B05127	Mabusii(Chemaika)	School	0.52235	34.42124
5	Bungoma South	128	B05128	Khelela-AC	School	0.53622	34.40746
5	Bungoma South	129	B05129	Bumula	H/C	0.54883	34.46019
5	Bungoma South	130	B05130	Myanga(Liporina Approved)	School	0.55682	34.38411
5	Bungoma South	131	B05131	Tulukui	School	0.58744	34.37691
5	Bungoma South	132	B05132	Kimaete	Disp	0.60433	34.40761
5	Bungoma South	133	B05133	Machwele	Disp	0.59647	34.44272
5	Bungoma South	134	B05134	Kibuke	Disp	0.60395	34.48852
5	Bungoma South	135	B05135	Grace-Med-Centre	Disp	0.59384	34.49941
5	Bungoma	136	B05136	Ng'oli	Chiefs-Camp	0.58409	34.50858



	South						
5	Bungoma South	137	B05137	Kibabi	H/C	0.61943	34.52559
5	Bungoma South	138	B05138	Kakichuma-RC	School	0.69084	34.53521
5	Bungoma South	139	B05139	Mayanja	Disp	0.65567	34.51494
5	Bungoma South	140	B05140	Mukwa-RC	School	0.67254	34.49459
5	Bungoma South	141	B05141	Miluki	Disp	0.64177	34.49633
5	Bungoma South	142	B05142	Siboti	Disp	0.63231	34.4574
5	Bungoma South	143	B05143	Netima	D.O's Office	0.65534	34.46894
5	Bungoma South	144	B05144	Musakasa-RC	School	0.64559	34.44824
5	Bungoma South	145	B05145	Kitabisi	Church	0.64282	34.41053
5	Bungoma South	146	B05146	Bitobo-RC	School	0.62273	34.3877
5	Bungoma South	147	B05147	Posta-Grounds	Church	0.56788	34.55902
5	Bungoma South	148	B05148	Namachanja	Chiefs-Camp	0.56415	34.55921
5	Bungoma South	149	B05149	Mashambani	Church	0.57028	34.56314
5	Bungoma South	150	B05150	Mupeli-Pri	School	0.55749	34.55877
5	Bungoma South	151	B05151	Oldrex	Church	0.55923	34.55493
5	Bungoma South	152	B05152	Mijini-Muslim	School	0.55137	34.55388
5	Bungoma South	153	B05153	River-Jordan	Med-Clinic	0.52912	34.53191
5	Bungoma South	154	B05154	Samoya-RC	School	0.54567	34.52789
5	Bungoma South	155	B05155	Muanda-Catholic	Church	0.56062	34.50815
5	Bungoma South	156	B05156	Siritanyi-Pri	School	0.57764	34.53382
5	Bungoma South	157	B05157	Kanduyi	D.O's Office	0.593	34.5531
5	Bungoma South	158	B05158	Ndengelwa(Nalutiri Pri)	School	0.59125	34.59985
5	Bungoma South	159	B05159	Bukembe	Disp	0.60859	34.65469
5	Bungoma South	160	B05160	Nzoia-Disp(Kongoli Pri)	School	0.56808	34.65269



5	Bungoma South	161	B05161	Sikalame-SA-Pri	School	0.51227	34.66259
5	Bungoma South	162	B05162	Mechimeru-Disp	Disp	0.50396	34.6517
5	Bungoma South	163	B05163	Fuchani-FYM-Pri	School	0.46987	34.58592
5	Bungoma South	164	B05164	Dorofu-Mkt	Church	0.45322	34.61377
5	Bungoma South	165	B05165	Mwikhupe-Pri	School	0.43663	34.58592
5	Bungoma South	166	B05166	Mumbule	Disp	0.48943	34.60796
5	Bungoma South	167	B05167	Mwibale-Fath Church	Church	0.48943	34.61125
5	Bungoma South	168	B05168	Sanga'lo-SDA	Church	0.51806	34.62751
5	Bungoma South	169	B05169	Ekitale	Disp	0.55458	34.61257
5	Bungoma South	170	B05170	Kitale-Pri	School	0.57532	34.62751
5	Bungoma South	171	B05171	Ranje-D.E.B	School	0.55152	34.57678
5	Bungoma South	172	B05172	Bulondo	Disp	0.48505	34.57432
5	Bungoma South	173	B05173	Namisi	School	0.46386	34.55717
5	Bungoma South	174	B05174	Naburereiya	School	0.50296	34.52466
5	Bungoma South	175	B05175	Vlm	Disp	0.50295	34.55581
5	Bungoma South	176	B05176	Kabula	Disp	0.48229	34.52919
6	Bungoma West	177	B06177	Sirisia	SDH(CCC)	0.75516	34.50757
6	Bungoma West	178	B06178	Namutokhole	School	0.7704	34.52997
6	Bungoma West	179	B06179	Chwele-Friends	Disp	0.76141	34.54932
6	Bungoma West	180	B06180	Kaptanai	Disp	0.78656	34.53651
6	Bungoma West	181	B06181	Kasiame	School	0.75438	34.47705
6	Bungoma West	182	B06182	St-Bonface	Disp	0.77081	34.47782
6	Bungoma West	183	B06183	Machakha	Disp	0.75569	34.43902
6	Bungoma West	184	B06184	Lwandanyi	Disp	0.78941	34.41494
6	Bungoma	185	B06185	Lwakhakha	Disp	0.7891	34.37909



	West						
6	Bungoma West	186	B06186	Korosiendet	Disp	0.7693	34.39324
6	Bungoma West	187	B06187	Tamlega	Disp	0.70759	34.41199
6	Bungoma West	188	B06188	Malakisi	H/C	0.68256	34.42072
6	Bungoma West	189	B06189	Bukekhole	Disp	0.69581	34.46317
6	Bungoma West	190	B06190	Butonge	Disp	0.71169	34.46959
6	Bungoma West	191	B06191	St Teresa Wokape	Disp	0.70918	34.48659
6	Bungoma West	192	B06192	Bisunu Chief's Camp	Chief's Camp	0.70911	34.50476
6	Bungoma West	193	B06193	Chwele	H/C	0.73431	34.57791
6	Bungoma West	194	B06194	Chwele	CCC	0.73406	34.57806
6	Bungoma West	195	B06195	Makhonge	Church	0.76483	34.56799
6	Bungoma West	196	B06196	Mukuyuni	Chief's Office	0.75816	34.60868
6	Bungoma West	197	B06197	Lukhome	Disp	0.77458	34.60425
6	Bungoma West	198	B06198	Kimalewa	H/C	0.78073	34.63977
6	Bungoma West	199	B06199	Sikulu	Disp	0.75126	34.63263
6	Bungoma West	200	B06200	Chebukaka	Disp	0.755	34.61455
6	Bungoma West	201	B06201	Madisi	School	0.71731	34.62965
6	Bungoma West	202	B06202	Khachonge	Disp	0.68494	34.62814
6	Bungoma West	203	B06203	Luyya	Disp	0.65194	34.63839
6	Bungoma West	204	B06204	Mabanga	Farmers Centre	0.59958	34.62122
6	Bungoma West	205	B06205	Ngalasia	Disp	0.62662	34.61406
6	Bungoma West	206	B06206	Nalonde	Disp	0.65533	34.58842
6	Bungoma West	207	B06207	Lwanda	Disp	0.69473	34.60379
6	Bungoma West	208	B06208	Mukhweya	Market-D.O's Ofc	0.67821	34.57662
6	Bungoma West	209	B06209	Kabuchai	H/C	0.64632	34.55986



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6	Bungoma West	210	B06210	Musokho	School	0.64834	34.54081
6	Bungoma West	211	B06211	Luuche	Disp	0.62687	34.55818
6	Bungoma West	212	B06212	Nangwe	Church	0.60983	34.58255
6	Bungoma West	213	B06213	Sikusi	Disp	0.69332	34.5579
7	Mt Elgon	214	B07214	Kamenje	Dispensary	N00.85277	E034.77174
7	Mt Elgon	215	B07215	Kaborom	Dispensary	N00.86638	E034.78542
7	Mt Elgon	216	B07216	Kaptama	Health Center	N00.87918	E034.77702
7	Mt Elgon	217	B07217	Kaboywe	Health Center	N00.91243	E034.76319
7	Mt Elgon	218	B07218	Kaptalelio	Dispensary	N00.89057	E034.74822
7	Mt Elgon	219	B07219	Mt Elgon D.H	Hospital	N00.84214	E034.71422
7	Mt Elgon	220	B07220	Kamuneru	Dispensary	N00.82261	E034.63985
7	Mt Elgon	221	B07221	Chepyuk	Church	N00.87348	E034.58943
7	Mt Elgon	222	B07222	Kopsiro	Health Center	N00.82277	E034.59030
7	Mt Elgon	223	B07223	Kipsigon	Health Center	N00.83183	E034.55984
7	Mt Elgon	224	B07224	Ruanda	Dispensary	N00.82390	E034.54397
7	Mt Elgon	225	B07225	Chelebei	Church	N00.81258	E034.55774
7	Mt Elgon	226	B07226	Kapsambu	Dispensary	N00.80008	E034.59409
7	Mt Elgon	227	B07227	Tuikut	Dispensary	N00.81263	E034.49839
7	Mt Elgon	228	B07228	Kanganga	Dispensary	N00.83473	E034.46462
7	Mt Elgon	229	B07229	Chepkube	Dispensary	N00.84009	E034.43328
7	Mt Elgon	230	B07230	Kimawa	Church	N00.82265	E034.45517
7	Mt Elgon	231	B07231	Cheptais S.D.H	Hospital	N00.80289	E034.46232
7	Mt Elgon	232	B07232	Kapkota	Dispensary	N00.79400	E034.48336
7	Mt Elgon	233	B07233	Chesikaki	Dispensary	N00.79371	E034.51192
7	Mt Elgon	234	B07234	Kapkateny	Dispensary	N00.80089	E034.62329
7	Mt Elgon	235	B07235	Sacha	Dispensary	N00.80338	E034.64190
7	Mt Elgon	236	B07236	Kamtiong	Market	N00.81155	E034.70322
7	Mt Elgon	237	B07237	Koshok	Dispensary	N00.83895	E034.66057
7	Mt Elgon	238	B07238	Mt Elgon D.H	Ccc	N00.84200	E034.71399
8	Bugoma East	239	B08239	Webuye-DH	Hosp	0.61337	34.76523
8	Bugoma East	240	B08240	Webuye H/C	H/C	0.61129	34.76781
8	Bugoma East	241	B08241	Panpaper Disp	Disp	0.59104	34.77755
8	Bugoma East	242	B08242	Lugulu-Mission	Hosp	0.66143	34.75318
8	Bugoma East	243	B08243	Sipala		0.64484	34.76529



8	Bugoma East	244	B08244	Mihuu-Disp	Disp	0.62555	34.79315
8	Bugoma East	245	B08245	Furoi		0.61653	34.61624
8	Bugoma East	246	B08246	Lugusi		0.65359	34.81343
8	Bugoma East	247	B08247	Sinoko		0.69927	34.7914
8	Bugoma East	248	B08248	Khaoya		0.72888	34.79807
8	Bugoma East	249	B08249	Ndivisi		0.71292	34.81052
8	Bugoma East	250	B08250	Namwaya		0.7203	34.75856
8	Bugoma East	251	B08251	Yasulwe		0.74345	34.78216
8	Bugoma East	252	B08252	Mitukuyu		0.6574	34.7799
8	Bugoma East	253	B08253	Matulo		0.59802	34.74129
8	Bugoma East	254	B08254	Khalmuli		0.57891	34.71385
8	Bugoma East	255	B08255	Yalusi		0.54297	34.70497
8	Bugoma East	256	B08256	Mang'ana		0.52223	34.68951
8	Bugoma East	257	B08257	Kuywa		0.50164	34.68612
8	Bugoma East	258	B08258	Sitikho		0.47461	34.65634
8	Bugoma East	259	B08259	Milo		0.53258	34.72266
8	Bugoma East	260	B08260	Lurare		0.56278	34.75363
8	Bugoma East	261	B08261	Nasaka		0.63562	34.65865
8	Bugoma East	262	B08262	Mahanga		0.68842	34.65303
8	Bugoma East	263	B08263	Bukoli SDH		0.71047	34.66198
8	Bugoma East	264	B08264	Namilimo		0.70445	34.67508
8	Bugoma East	265	B08265	Miendo-Disp		0.65231	34.69063
8	Bugoma East	266	B08266	Namawanga		0.68079	34.70138
8	Bugoma East	267	B08267	Sirisia		0.67874	34.71114
8	Bugoma East	268	B08268	Sirende		0.72086	34.70016



	East						
8	Bugoma East	269	B08269	Mukhe		0.71197	34.71495
8	Bugoma East	270	B08270	Makhese		0.67686	34.74834
8	Bugoma East	271	B08271	Nabuyole		0.61102	34.79096
8	Bugoma East	272	B08272	Kituni		0.66334	34.72928
8	Bugoma East	273	B08273	Wamangoli		0.62258	34.70758
9	Bungoma North	274	B09274	Kimilili-District-Cee	Hospital	N00.789170	E034.712610
9	Bungoma North	275	B09275	Kamasiele	Polytechnic	N00.810720	E034.727950
9	Bungoma North	276	B09276	Kamusinde (Rea)	Church	N00.813510	E034.741530
9	Bungoma North	277	B09277	Nasusi	Dispensary	N00.817860	E034.758800
9	Bungoma North	278	B09278	Namboani (Fym)	School	N00.841840	E034.760770
9	Bungoma North	279	B09279	Maeni	Dispensary	N00.782200	E034.751810
9	Bungoma North	280	B09280	Sikhendu-Fym	School	N00.768490	E034.760340
9	Bungoma North	281	B09281	Chebkwabi	Polytechnic	N00.797410	E034.667400
9	Bungoma North	282	B09282	Nasianda (Kag)	Church	N00.761390	E034.674560
9	Bungoma North	283	B09283	Bituyu	Dispensary	N00.743920	E034.699580
9	Bungoma North	284	B09284	Kibingei	Dispensary	N00.741270	E034.672660
9	Bungoma North	285	B09285	Kibingei-Farmers	Factory	N00.737190	E034.687750
9	Bungoma North	286	B09286	Salvation Army Hq	Church	N00.737190	E034.687750
9	Bungoma North	287	B09287	Chelekei	School	N00.731490	E034.734360
9	Bungoma North	288	B09288	Bahai	Dispensary	N00.738940	E034.749280
9	Bungoma North	289	B09289	Matili-Re	School	N00.759690	E034.741110
9	Bungoma North	290	B09290	Nakalira (Catholic)	Church	N00.760100	E034.804970
9	Bungoma North	291	B09291	Makhonge	Health-Centre	N00.821240	E034.796980
9	Bungoma North	292	B09292	Kamukuywa Proposed	Dispensary	N00.780330	E034.790000



9	Bungoma North	293	B09293	Dreamland	Medical Centre	N00.807920	E034.696750
9	Bungoma North	294	B09294	Khuirore	School	N00.794260	E034.688840
9	Bungoma North	295	B09295	Naitiri-Sdh-Cee	Hospital	N00.756100	E034.891090
9	Bungoma North	296	B09296	Kibisi	Dispensary	N00.697230	E034.862840
9	Bungoma North	297	B09297	Karima	Dispensary	N00.725580	E034.855860
9	Bungoma North	298	B09298	Soteni	Dispensary	N00.732070	E034.872060
9	Bungoma North	299	B09299	Pwani	Dispensary	N00.697470	E034.901990
9	Bungoma North	300	B09300	Sirakaru	Dispensary	N00.725760	E034.897220
9	Bungoma North	301	B09301	Sango-Kabuyefwe	Dispensary	N00.752950	E034.925670
9	Bungoma North	302	B09302	Lungai	Dispensary	N00.779490	E034.898460
9	Bungoma North	303	B09303	Makhanga	Dispensary	N00.808060	E034.887880
9	Bungoma North	304	B09304	Sango-Naitiri	Dispensary	N00.832090	E034.910340
9	Bungoma North	305	B09305	Tabani	Dispensary	N00.848660	E034.943530
9	Bungoma North	306	B09306	Minyali-Ack	Church	N00.871380	E034.966720
9	Bungoma North	307	B09307	Ndalu	Health-Centre	N00.843190	E034.993190
9	Bungoma North	308	B09308	Misanga-Fym	Church	N00.804100	E035.023730
9	Bungoma North	309	B09309	Makutano	Dispensary	N00.786760	E035.036940
9	Bungoma North	310	B09310	Maresi-Fym	Church	N00.751370	E035.022340
9	Bungoma North	311	B09311	Soysambu-Pag	Church	N00.765450	E035.003550
9	Bungoma North	312	B09312	Ack-Soysambu	Dispensary	N00.765400	E035.003490
9	Bungoma North	313	B09313	Tongaren	Health-Centre	N00.774000	E034.968250
9	Bungoma North	314	B09314	Lukhuna	Dispensary	N00.801160	E034.938140
9	Bungoma North	315	B09315	Makhonge-Pefa	Church	N00.770870	E034.939930
9	Bungoma North	316	B09316	Makunga-Pag	Church	N00.733010	E034.832130
9	Bungoma North	317	B09317	Ack-Kamukuywa	Dispensary	N00.766400	E034.831430



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	North						
9	Bungoma North	318	B09318	Lukhokhwe-Fym	Church	N00.797430	E034.842410
9	Bungoma North	319	B09319	Wabukhonyi-Re	Church	N00.803070	E034.866680
10	Mumias	320	C10320	DMOH's Office	DMOH's Office	0.3393	34.49034
10	Mumias	321	C10321	Khaunga-Disp	Disp	0.37689	34.58406
10	Mumias	322	C10322	Mahola-Pri	School	0.3834	34.56939
10	Mumias	323	C10323	Malaha-Disp	Disp	0.3553	34.61364
10	Mumias	324	C10324	Muganga-Disp	Disp	0.34654	34.57866
10	Mumias	325	C10325	Nyaporo-Disp	Disp	0.32964	34.62579
10	Mumias	326	C10326	Makunga-RHDC	H/C	0.3028	34.62354
10	Mumias	327	C10327	Eluche-Clinic	Clinic	0.32895	34.54213
10	Mumias	328	C10328	Khabakaya-Pri	School	0.33091	34.56214
10	Mumias	329	C10329	Shianda-Baptist Clinic	Clinic	0.31585	34.57634
10	Mumias	330	C10330	Mutono-Pri	School	0.27866	34.58923
10	Mumias	331	C10331	Elwasambi-Disp	Disp	0.28896	34.56793
10	Mumias	332	C10332	Bumwende-Pri	School	0.28098	34.54721
10	Mumias	333	C10333	Lushea-H/C	H/C	0.30451	34.53601
10	Mumias	334	C10334	Mumias-Disp	Disp	0.33442	34.48047
10	Mumias	335	C10335	Shikalame-Disp	Disp	0.25698	34.46379
10	Mumias	336	C10336	Eshihaka-Pri	School	0.21576	34.46443
10	Mumias	337	C10337	Musanda-Pri	School	0.21977	34.44902
10	Mumias	338	C10338	Bungasi-H/C	H/C	0.1996	34.39122
10	Mumias	339	C10339	Lukongo-Pri	School	0.23512	34.40754
10	Mumias	340	C10340	Wang'nyang-Pri	School	0.26749	34.3997
10	Mumias	341	C10341	Bukaya-H/C	H/C	0.26	34.44939
10	Mumias	342	C10342	Otiato-Sch	School	0.2753	34.44086
10	Mumias	343	C10343	Shikulu-Community H/C	H/C	0.30173	34.43927
10	Mumias	344	C10344	Emuchimi-Disp	Disp	0.32817	34.45175
10	Mumias	345	C10345	Ebubaka-Pri	School	0.31819	34.41966
10	Mumias	346	C10346	Kamasha-Pri	School	0.29325	34.50679
10	Mumias	347	C10347	Ichinga-Pri	School	0.33794	34.50567
10	Mumias	348	C10348	Shibale-Pri	School	0.36268	34.48473
10	Mumias	349	C10349	Musco	Disp	0.35916	34.49263
10	Mumias	350	C10350	St Marys-Hosp	Hosp	0.32696	34.49897
10	Mumias	351	C10351	Enyaporo-Disp	Disp	0.31952	34.4902
10	Mumias	352	C10352	Mayoni-Pri	School	0.3789	34.4888
10	Mumias	353	C10353	Mwira-Pri	School	0.36509	34.44956



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10	Mumias	354	C10354	Indangalasia-Disp	Disp	0.31675	34.39497
10	Mumias	355	C10355	Mungungu-Disp	Disp	0.39909	34.41037
10	Mumias	356	C10356	Lubanga-Pri	School	0.41234	34.36768
10	Mumias	357	C10357	Lunganyiro-Disp	Disp	0.43262	34.39246
10	Mumias	358	C10358	St Paul-Ejinja-Disp	Disp	0.40245	34.44805
10	Mumias	359	C10359	Matungu-SDH	Hosp	0.38792	34.47634
10	Mumias	360	C10360	Namulungu-Disp	Disp	0.45113	34.46247
10	Mumias	361	C10361	Mukhweya-Pri	School	0.46117	34.48918
10	Mumias	362	C10362	Khalaba-H/C	H/C	0.42734	34.54832
10	Mumias	363	C10363	Namamba-Pri	School	0.44425	34.55601
10	Mumias	364	C10364	Bulimbo-Mission	Church	0.44059	34.51208
10	Mumias	365	C10365	Khabukhoshe-Pri	School	0.42609	34.51217
10	Mumias	366	C10366	Mirere-H/C	H/C	0.45476	34.42783
10	Mumias	367	C10367	Shibanze-Disp	Disp	0.4107	34.52447
11	Kakamega Central	368	C11368	Approved-Disp	Disp	0.29318	34.76131
11	Kakamega Central	369	C11369	Sichirai-Market	Market	0.30242	34.76328
11	Kakamega Central	370	C11370	Pgh-Kak	Hosp	0.27432	34.7606
11	Kakamega Central	371	C11371	Shitao-Pri	School	0.26056	34.75172
11	Kakamega Central	372	C11372	Chief's-Camp Bukhungu	Camp	0.26056	34.75172
11	Kakamega Central	373	C11373	Maraba-Pri	School	0.29522	34.74433
11	Kakamega Central	374	C11374	Nabongo-Pri	School	0.28451	34.74539
11	Kakamega Central	375	C11375	Rosterman-Field		0.26358	34.72922
11	Kakamega Central	376	C11376	Ikonjero-Disp	Disp	0.28084	34.72538
11	Kakamega Central	377	C11377	Elwesero-Disp	Disp	0.2652	34.71645
11	Kakamega Central	378	C11378	Ibinzo-Pri	School	0.25625	34.68779
11	Kakamega Central	379	C11379	Eshisiru-D-O's-Office		0.2812	34.67367
11	Kakamega Central	380	C11380	Emusanda-Disp	Disp	0.29307	34.64707
11	Kakamega Central	381	C11381	Emusala-Church	Church	0.32971	34.78043
11	Kakamega Central	382	C11382	Emukaba-Pri	School	0.34166	34.76309
11	Kakamega Central	383	C11383	Ematiah-Disp	Disp	0.36153	34.76605



11	Kakamega Central	384	C11384	Bushiri-Church	Church	0.36504	34.72916
11	Kakamega Central	385	C11385	Ingotse-Pri	School	0.3555	34.698
11	Kakamega Central	386	C11386	Shinoyi(Mukangu Mkt)	Market	0.34535	34.666
11	Kakamega Central	387	C11387	Shikomari(Nangabo Mkt)	Market	0.32106	34.64455
11	Kakamega Central	388	C11388	Eshiongo-Disp	Disp	0.31418	34.69385
11	Kakamega Central	389	C11389	Esumeiya		0.31844	34.682
11	Kakamega Central	390	C11390	Eshikhuyu-Disp	Disp	0.26474	34.65593
11	Kakamega Central	391	C11391	Isumba-Disp	Disp	0.24222	34.63961
11	Kakamega Central	392	C11392	Mwiyenga-ACK Church	Church	0.20583	34.6342
11	Kakamega Central	393	C11393	Buikulima-SA Church	Church	0.19314	34.6135
11	Kakamega Central	394	C11394	Ekapwonje-Pri	School	0.21665	34.61435
11	Kakamega Central	395	C11395	Eshanda-Church	Church	0.23147	34.62019
11	Kakamega Central	396	C11396	Eshirembe-Disp	Disp	0.25437	34.62122
11	Kakamega Central	397	C11397	Ematsayi-Pri	School	0.2785	34.62142
11	Kakamega Central	398	C11398	Shiyunzu-Pri	School	0.29079	34.70321
11	Kakamega Central	399	C11399	Ejinja-Friends	Church	0.28118	34.71179
11	Kakamega Central	400	C11400	Elukho-Pri	School	0.32288	34.75654
11	Kakamega Central	401	C11401	Emukoyani		0.32179	34.74984
11	Kakamega Central	402	C11402	Emurumba-Disp	Disp	0.30323	34.72617
11	Kakamega Central	403	C11403	Shikoti-Chief's Camp	Camp	0.31776	34.73584
11	Kakamega Central	404	C11404	Ebushibo-PAG	Church	0.30625	34.68554
11	Kakamega Central	405	C11405	Lusumu-Pri	School	0.36506	34.64702
11	Kakamega Central	406	C11406	Nderema-Pri	School	0.3631	34.62919
11	Kakamega Central	407	C11407	Busangavia-Mkt	Market	0.36377	34.66127
11	Kakamega	408	C11408	Kisembe-Pri	School	0.40047	34.64291



	Central						
11	Kakamega Central	409	C11409	Matei-Disp	Disp	0.36881	34.71162
11	Kakamega Central	410	C11410	Budonga-Disp	Disp	0.39812	34.61023
11	Kakamega Central	411	C11411	Sisokhe-Disp	Disp	0.42303	34.61184
11	Kakamega Central	412	C11412	Kharanda-Disp	Disp	0.44146	34.63681
11	Kakamega Central	413	C11413	Buchangu-Disp	Disp	0.44564	34.67083
11	Kakamega Central	414	C11414	Sivilie-Disp	Disp	0.46955	34.69675
11	Kakamega Central	415	C11415	Lutase-Disp	Disp	0.44406	34.71081
11	Kakamega Central	416	C11416	Chekata-Disp	Disp	0.46721	34.72059
11	Kakamega Central	417	C11417	Siombe-Pri	School	0.44188	34.68508
11	Kakamega Central	418	C11418	Navakholo-SDH	Hosp	0.41373	34.68229
11	Kakamega Central	419	C11419	Namakoye-Mkt	Market	0.42095	34.64723
11	Kakamega Central	420	C11420	Nambacha-Pri	School	0.39339	34.66729
12	Kakamega North	421	C12421	Chebwai	Disp	0.49625	34.83288
12	Kakamega North	422	C12422	Namagara	Disp	0.50423	34.87856
12	Kakamega North	423	C12423	Cheptuli	Church	0.50517	34.86676
12	Kakamega North	424	C12424	Makuche	Church	0.5149	34.79284
12	Kakamega North	425	C12425	Chugulo	Disp	0.50131	34.78129
12	Kakamega North	426	C12426	Matsakha	Church	0.52555	34.81602
12	Kakamega North	427	C12427	Shivanga	Disp	0.53215	34.84648
12	Kakamega North	428	C12428	Chimoi	H/C	0.57258	34.83079
12	Kakamega North	429	C12429	Manda	Disp	0.5719	34.86294
12	Kakamega North	430	C12430	Tumbeni	School	0.4305	34.86858
12	Kakamega North	431	C12431	Kimanget	Disp	0.43172	34.91015
12	Kakamega North	432	C12432	Ikoli	School	0.39296	34.94145



12	Kakamega North	433	C12433	Kuvasali	H/C	0.42101	34.94334
12	Kakamega North	434	C12434	Chimoroni	School	0.45461	34.9094
12	Kakamega North	435	C12435	Shipala	School	0.47004	34.81436
12	Kakamega North	436	C12436	Malekha	Disp	0.44784	34.79565
12	Kakamega North	437	C12437	Shirugu	School	0.46216	34.79028
12	Kakamega North	438	C12438	Chombeli	H/C	0.45627	34.75185
12	Kakamega North	439	C12439	Malava	DH	0.44884	34.854
12	Kakamega North	440	C12440	Mugai	Disp	0.43177	34.80751
12	Kakamega North	441	C12441	Shamberere	Disp	0.37706	34.84219
12	Kakamega North	442	C12442	Shihome	Disp	0.39126	34.79236
12	Kakamega North	443	C12443	Chevoso	Disp	0.36584	34.81232
12	Kakamega North	444	C12444	Mahira	Church	0.40324	34.80492
12	Kakamega North	445	C12445	Muting'ong'o	Disp	0.40486	34.82211
12	Kakamega North	446	C12446	Ifwetere	School	0.3488	34.79007
12	Kakamega North	447	C12447	Shivakala	Church	0.36788	34.77733
12	Kakamega North	448	C12448	Burundo	Church	0.44069	34.75456
12	Kakamega North	449	C12449	Sawawa	Market	0.41775	34.75393
12	Kakamega North	450	C12450	Mukume	Church	0.38991	34.75287
12	Kakamega North	451	C12451	Imbiakalo	Disp	0.41036	34.75269
13	Lugari	452	C13452	Lumakanda-DH	Hosp	0.6347	34.97607
13	Lugari	453	C13453	Nys-Turbo	Disp	0.64221	35.04925
13	Lugari	454	C13454	Mautuma-SDH	Hosp	0.72477	34.98162
13	Lugari	455	C13455	Mbagara-Disp	Disp	0.72579	35.00849
13	Lugari	456	C13456	Mukuyu-Disp	Disp	0.73266	34.94977
13	Lugari	457	C13457	Marakusi-Disp	Disp	0.69831	34.95222
13	Lugari	458	C13458	Lugari-Forest	Disp	0.66103	34.90762
13	Lugari	459	C13459	Lunyito-Disp	Disp	0.67356	34.8755
13	Lugari	460	C13460	Mapengo-Disp	Disp	0.64819	34.85999



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13	Lugari	461	C13461	Mahanga-Disp	Disp	0.63416	34.8521
13	Lugari	462	C13462	Koromati-Disp	Disp	0.62793	34.88428
13	Lugari	463	C13463	Chekalini H/C	H/C	0.6193	34.89858
13	Lugari	464	C13464	Musembe-Disp	Disp	0.61927	34.93005
13	Lugari	465	C13465	Turbo-Forest	Disp	0.6356	35.06246
13	Lugari	466	C13466	Seregeya-Disp	Disp	0.66377	35.10743
13	Lugari	467	C13467	Likuyani-SDH	Hosp	0.71083	35.10712
13	Lugari	468	C13468	Sango-Disp	Disp	0.72898	35.07297
13	Lugari	469	C13469	Lugulu-Chiefs-Camp	Chiefs-Camp	0.76762	35.07803
13	Lugari	470	C13470	Soysambu-Disp	Disp	0.77718	35.10485
13	Lugari	471	C13471	Kongoni H/C	H/C	0.78308	35.13105
13	Lugari	472	C13472	Matunda-SDH	Hosp	0.82557	35.11538
13	Lugari	473	C13473	Mabusi H/C	H/C	0.83425	35.0805
13	Lugari	474	C13474	Sinoko-Disp	Disp	0.86797	35.07627
13	Lugari	475	C13475	Moi's Bridge N.Home	Maternity Home	0.88089	35.1188
13	Lugari	476	C13476	Majengo-Disp	Disp	0.64857	35.00085
13	Lugari	477	C13477	Munyuki-Disp	Disp	0.63492	34.9393
13	Lugari	478	C13478	Maturu-Disp	Disp	0.60592	34.86652
13	Lugari	479	C13479	Nzeia-Matete	Disp	0.60391	34.81742
13	Lugari	480	C13480	Matete H/C	H/C	0.56511	34.80562
13	Lugari	481	C13481	Nambilima	School	0.51813	34.74989
13	Lugari	482	C13482	Lumani	Disp	0.48967	34.72386
13	Lugari	483	C13483	Marukusi	School	0.5408	34.78721
13	Lugari	484	C13484	Mbajo	School	0.61086	34.94933
13	Lugari	485	C13485	Mahemas	School	0.67364	34.96615
13	Lugari	486	C13486	Lwanda-Lugari	School	0.67661	34.97843
13	Lugari	487	C13487	Ivona-East	School	0.73762	34.99887
13	Lugari	488	C13488	Lukusi	School	0.71371	35.0635
13	Lugari	489	C13489	Nasianda	School	0.75087	35.11192
13	Lugari	490	C13490	Lumino	Disp	0.71044	35.15073
13	Lugari	491	C13491	Aligula	School	0.66556	35.14243
13	Lugari	492	C13492	Moi's Bridge-Pri	School	0.85897	35.09852
13	Lugari	493	C13493	Binyenya Friends	Church	0.808813	35.06635
13	Lugari	494	C13494	Mwamba-Pri	School	0.62757	35.024
13	Lugari	495	C13495	St Andrews Orthodox	Church	0.71887	34.94397
13	Lugari	496	C13496	St Marys	Disp	0.70797	35.0091
14	Kakamega	497	C14497	Mwihila	Mission Hosp	0.17773	34.61393
14	Kakamega	498	C14498	Mwitseshe	Disp	0.18471	34.64361



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14	Kakamega	499	C14499	Ikomero	Disp	0.15182	34.50088
14	Kakamega	500	C14500	Emalindi	H/C	0.13171	34.61713
14	Kakamega	501	C14501	Mundobelwa	Disp	0.15724	34.61293
14	Kakamega	502	C14502	Munyanza	MNH	0.1838	34.5871
14	Kakamega	503	C14503	Emulunya	School	0.14479	34.65527
14	Kakamega	504	C14504	Munjiti	School	0.13524	34.67556
14	Kakamega	505	C14505	Ituti	Rotary Post	0.24431	34.58141
14	Kakamega	506	C14506	Eshitari	School	0.2544	34.60285
14	Kakamega	507	C14507	Maondo	School	0.19087	34.44404
14	Kakamega	508	C14508	Shatsala	School	0.17491	34.47796
14	Kakamega	509	C14509	Butere	DH	0.20864	34.4935
14	Kakamega	510	C14510	Manyala	SDH	0.16099	34.45242
14	Kakamega	511	C14511	Shitsiswi	H/C	0.26325	34.50429
14	Kakamega	512	C14512	Shisaba	Disp	0.23723	34.54687
14	Kakamega	513	C14513	Shimkoko	H/C	0.21534	34.56581
14	Kakamega	514	C14514	Shiraha	H/C	0.1968	34.57071
14	Kakamega	515	C14515	Shikunga	H/C	0.18262	34.53882
14	Kakamega	516	C14516	Lukohe	H/C	0.19687	34.59984
14	Kakamega	517	C14517	Mabole	H/C	0.18594	34.50627
14	Kakamega	518	C14518	Masaba	Disp	0.19358	34.46411
14	Kakamega	519	C14519	Iranda	H/C	0.2442	34.59647
14	Kakamega	520	C14520	Echibimbi	H/C	0.2109	34.59632
14	Kakamega	521	C14521	Imanga	H/C	0.27533	34.47337
14	Kakamega	522	C14522	Shibuche	School	0.26171	34.48226
14	Kakamega	523	C14523	Ebukhokolo	School	0.15993	34.4804
14	Kakamega	524	C14524	Emutsetsa	Disp	0.16373	34.53021
14	Kakamega	525	C14525	Namasoli	H/C	0.14439	34.5289
14	Kakamega	526	C14526	Muhaka	Disp	0.12284	34.48392
14	Kakamega	527	C14527	Walmar	Med Clinic	0.09897	34.55602
14	Kakamega	528	C14528	Mundoli	H/C	0.10941	34.57752
14	Kakamega	529	C14529	Mulwanda	Disp	0.14346	34.56704
14	Kakamega	530	C14530	Khwisere	H/C	0.16848	34.59602
14	Kakamega	531	C14531	Elwangale	H/C	0.15556	34.67379
14	Kakamega	532	C14532	Eshinutsa	H/C	0.14706	34.63511
14	Kakamega	533	C14533	Sonak	Med Centre	0.17242	34.59256
15	Kakamega South	534	C15534	Shikokho Friends	Church	0.1802	34.72015
15	Kakamega South	535	C15535	Shikondi Pri	School	0.1876	34.75921
15	Kakamega	536	C15536	Ichina Pri	School	0.21122	34.70567



	South						
15	Kakamega South	537	C15537	Shihalia-Disp	Disp	0.17724	34.69844
15	Kakamega South	538	C15538	Shichinji-Pri	School	0.20921	34.68661
15	Kakamega South	539	C15539	Bushianga	H/C	0.18727	34.68391
15	Kakamega South	540	C15540	St Pius-Musoli	H/C	0.20518	34.66434
15	Kakamega South	541	C15541	Mutaho-Pri	School	0.22265	34.67008
15	Kakamega South	542	C15542	Murudefu-Pri	School	0.18627	34.65159
15	Kakamega South	543	C15543	Imuchenje-Church	Church	0.21236	34.64397
15	Kakamega South	544	C15544	Imbale-Pri	School	0.22438	34.63565
15	Kakamega South	545	C15545	Imulama-Disp	Disp	0.23991	34.67027
15	Kakamega South	546	C15546	Shimanyiro Friends	Church	0.25424	34.68836
15	Kakamega South	547	C15547	Shiseso	H/C	0.2314	34.7038
15	Kakamega South	548	C15548	Iguhu-DH	CCC	0.16324	34.74604
15	Kakamega South	549	C15549	Masyenze-Pri	School	0.1797	34.76703
15	Kakamega South	550	C15550	Savane-Disp	Disp	0.1718	34.78982
15	Kakamega South	551	C15551	Naliava-Pri	School	0.15849	34.79206
15	Kakamega South	552	C15552	Shianjetso-Pri	School	0.15322	34.73212
15	Kakamega South	553	C15553	Madivini Friends	Church	0.14293	34.70736
15	Kakamega South	554	C15554	Kaluni-Pri	School	0.13628	34.69807
15	Kakamega South	555	C15555	Kilingili-H/C	CCC	0.12419	34.68086
15	Kakamega South	556	C15556	Lwanaswa-Pri	School	0.13837	34.68436
15	Kakamega South	557	C15557	Iregi-H/C	H/C	0.15436	34.70259
15	Kakamega South	558	C15558	Imalaba-Disp	Disp	0.16252	34.68581
15	Kakamega South	559	C15559	Itulubini-Pri	School	0.16649	34.69729
15	Kakamega South	560	C15560	Ikhulili-Pri	School	0.16204	34.7153



15	Kakamega South	561	C15561	Shibwe SDH	CCC	0.20565	34.72319
16	Kakamega East	562	C16562	Kambiri H/C	Clinic	0.34409	34.91101
16	Kakamega East	563	C16563	Kakamega Forest Disp	Disp	0.23567	34.86758
16	Kakamega East	564	C16564	Shamakhubu H/C	H/C	0.26477	34.82779
16	Kakamega East	565	C16565	Shikusi-Disp	Disp	0.20375	34.79915
16	Kakamega East	566	C16566	Mukumu MH	Hosp	0.21297	34.76909
16	Kakamega East	567	C16567	Kambiri F.C	Church	0.30604	29.30402
16	Kakamega East	568	C16568	Muranda Med-Clinic	Clinic	0.05142	31.80203
16	Kakamega East	569	C16569	Shinyalu H/C	H/C	0.012041	26.27101
16	Kakamega East	570	C16570	Solyo Pri	School	0.017203	28.30104
16	Kakamega East	571	C16571	Shanjero Pri	School	0.018203	32.31204
16	Kakamega East	572	C16572	Munasio Pri	School	0.028204	35.5856
16	Kakamega East	573	C16573	Munyanda Pri	School	0.03842	32.2021
16	Kakamega East	574	C16574	Senyende Pri	School	0.038302	30.3021
16	Kakamega East	575	C16575	Shilolavakhali Youth Poly	Polytech	0.2642	30.40321
16	Kakamega East	576	C16576	Wanzalala Pri	School	0.30472	35.7234
16	Kakamega East	577	C16577	Ikuywa-Disp	Disp	0.03641	30.40261
16	Kakamega East	578	C16578	Shimuli Med-Clinic		0.05142	31.80203
16	Kakamega East	579	C16579	Mahatma Gandhi		0.223091	36.7082
16	Kakamega East	580	C16580	St Pauline N.H	N.Home	0.24203	38.4026
16	Kakamega East	581	C16581	St Phillips Mukomari Disp	Disp	0.27472	35.8272
16	Kakamega East	582	C16582	Muranda Friends	Church	0.016201	30.30104
16	Kakamega East	583	C16583	Mugomari Med Clinic		0.020103	28.32401
16	Kakamega East	584	C16584	Ingolomosio Friends	Church	0.032487	35.48611
16	Kakamega	585	C16585	Musembe-Disp	Disp	0.041304	29.3022



	East						
16	Kakamega East	586	C16586	Ileho H/C	H/C	0.2746	34.7634
16	Kakamega East	587	C16587	Iwakale-Pri	School	0.2835	32.3634
16	Kakamega East	588	C16588	Lugara-Friends	Church	0.3464	28.3968
17	Eumhaya	589	D17589	Ebusiekwe-Ebukoolo Ack	Church	0.07111	34.56529
17	Eumhaya	590	D17590	Ebukanga-Isanda-Pri	School	0.10884	34.60453
17	Eumhaya	591	D17591	Emusire-High Sch	School	0.07935	34.60774
17	Eumhaya	592	D17592	Essaba-C.O.G	School	0.04414	34.59134
17	Eumhaya	593	D17593	Ebukhaya-Emabuye C.O.G	Church	0.07474	34.61984
17	Eumhaya	594	D17594	Emanyinyia-Sec	Church	0.09576	34.61639
17	Eumhaya	595	D17595	Ematsuli-Pri	School	0.11358	34.63265
17	Eumhaya	596	D17596	Emurembe-Pri	School	0.11104	34.67414
17	Eumhaya	597	D17597	Munungu-C.O.G	School	0.11599	34.65952
17	Eumhaya	598	D17598	Ebunangwe-Sec	School	0.08891	34.65731
17	Eumhaya	599	D17599	Ebusiloli-C.O.G	Church	0.0743	34.66585
17	Eumhaya	600	D17600	Ebusiratsi-Sec	School	0.08855	34.63767
17	Eumhaya	601	D17601	Ematsi-Sec	School	0.00859	34.62067
17	Eumhaya	602	D17602	Ebuyalu-Sec	School	0.08047	34.57181
17	Eumhaya	603	D17603	Emmuli-Esianduba Ack	Church	0.03537	34.56776
17	Eumhaya	604	D17604	Ebwiranyi-ACK	Church	0.01515	34.56011
17	Eumhaya	605	D17605	Ebulonga-Ekayila C.O.G	Church	0.03077	34.56914
17	Eumhaya	606	D17606	Ekwanda-ACK	Church	0.02009	34.57222
17	Eumhaya	607	D17607	Ebulonga-Ebusembe Ack	Church	0.00983	34.58611
17	Eumhaya	608	D17608	Ebusanda-ACK	Church	0.00249	34.59059
17	Eumhaya	609	D17609	Coptic-Orthodox	Church	0.01081	34.60541
17	Eumhaya	610	D17610	Emmuli-Ebutuku C.O.G	Church	0.03378	34.55816
17	Eumhaya	611	D17611	Mumboha-C.O.G	Church	0.02497	34.58497
17	Eumhaya	612	D17612	Epang'la-COG	Church	0.03156	34.60047
17	Eumhaya	613	D17613	Ebulonga-Ematioli Skyhigh	School	0.04554	34.61645
17	Eumhaya	614	D17614	Irumbi-Pri	School	0.06072	34.62984
17	Eumhaya	615	D17615	Esongole-Sec	School	0.04835	34.64217
17	Eumhaya	616	D17616	Ibubbi-COG	Church	0.03581	34.63571
17	Eumhaya	617	D17617	Hobunaka-Sec	School	0.02115	34.6337



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17	Eumhaya	618	D17618	Kima-Mission Hosp	Hospital	0.02574	34.62392
17	Eumhaya	619	D17619	Emabwe-Pri	School	0.09481	34.58765
18	Vihiga	620	D18620	Vihiga-D.H	District Hosp	0.07947	34.72277
18	Vihiga	621	D18621	Idavaga-Pri	School	0.0817	34.72107
18	Vihiga	622	D18622	Enanga-Pri	School	0.00527	34.69699
18	Vihiga	623	D18623	Kigadahi-Pri	School	0.01302	34.67745
18	Vihiga	624	D18624	Idereri-Pri	School	0.01398	34.69883
18	Vihiga	625	D18625	Vigetse-Pri	Salvation Church	0.01992	34.69292
18	Vihiga	626	D18626	Kisienya-Pri	School	0.04393	34.66601
18	Vihiga	627	D18627	Madzu-Salvation	Church	0.03188	34.6736
18	Vihiga	628	D18628	Chanzeywe-Pri	School	0.02421	34.6664
18	Vihiga	629	D18629	Kerongo-Pri	School	0.00904	34.64842
18	Vihiga	630	D18630	Madzugi-Pri	School	0.00965	34.6791
18	Vihiga	631	D18631	Mbale-Rural	Training Centre	0.08022	34.72207
18	Vihiga	632	D18632	Chango-Friends	Church	0.0576	34.72692
18	Vihiga	633	D18633	Navuhi-Friends	Church	0.04954	34.73341
18	Vihiga	634	D18634	Chanzaruka-P.A.G	Church	0.04368	34.70136
18	Vihiga	635	D18635	Vihiga-Friends	Church	0.0371	34.71105
18	Vihiga	636	D18636	Vihiga-H/C	Health-Centre	0.03901	34.71471
18	Vihiga	637	D18637	Vumale-Pri	School	0.07515	34.72767
18	Vihiga	638	D18638	Iduku-Pri	School	0.07803	34.69242
18	Vihiga	639	D18639	Busamo-Salvation	Church	0.07906	34.67718
18	Vihiga	640	D18640	Kereda-P.A.G	Church	0.0529	34.66906
18	Vihiga	641	D18641	Magui-Friends	Church	0.05561	34.6988
18	Vihiga	642	D18642	Buhani-ACK	Church	0.01701	34.65946
18	Vihiga	643	D18643	Kivagala-Friends	Church	0.06761	34.75381
18	Vihiga	644	D18644	Mudete-PAG	Church	0.11321	34.78567
18	Vihiga	645	D18645	Mabai-Friends	Church	0.09452	34.70119
18	Vihiga	646	D18646	Munugi-Friends	Church	0.09625	34.71016
18	Vihiga	647	D18647	Lwunza-Friends	Church	0.11371	34.72847
18	Vihiga	648	D18648	Walodeya-PAG	Church	0.11109	34.64735
18	Vihiga	649	D18649	Viyalo-Friends	Church	0.1283	34.7142
18	Vihiga	650	D18650	Kegondi-Friends	Church	0.12492	34.74971
18	Vihiga	651	D18651	Kisatiru-Friends	Church	0.12492	34.74971
18	Vihiga	652	D18652	Mulele-PAG	Church	0.13029	34.75844
18	Vihiga	653	D18653	Bugina-Friends	Church	0.14027	34.76826
18	Vihiga	654	D18654	Budagwa-Friends	Church	0.14369	34.78055
18	Vihiga	655	D18655	Chamakanga	Church	0.14716	34.79554



				Catholic			
18	Vihiga	656	D18656	Chavogere-Mission	Church	0.15096	34.81052
18	Vihiga	657	D18657	Busweta-Friends	Church	0.12222	34.8147
18	Vihiga	658	D18658	Mudungu-Salvation Army	Church	0.10413	34.79711
18	Vihiga	659	D18659	Kigama-Friends Church	Church	0.0929	34.76733
18	Vihiga	660	D18660	Malemba-PAG	Church	0.09929	34.74448
18	Vihiga	661	D18661	Tsimbalo-PAG	Church	0.0847	34.72758
18	Vihiga	662	D18662	Sabatia-CCC	Health-Facility	0.12086	34.78708
19	Hamisi	663	D19663	Bumuyange	Church	0.09876	34.81628
19	Hamisi	664	D19664	Hamisi-Stadium	Stadium	0.06907	34.71602
19	Hamisi	665	D19665	Jembrongo-Pri	School	0.07251	34.78964
19	Hamisi	666	D19666	Buvai-Israel	Church	0.07245	34.76096
19	Hamisi	667	D19667	Kimogoi-Disp	Facility	0.05252	34.7792
19	Hamisi	668	D19668	Saride-Pri	School	0.02899	34.77245
19	Hamisi	669	D19669	Tambua-D-O's-Office	Admin's-Ofc	0.01689	34.76506
19	Hamisi	670	D19670	Mwembe-Mkt	Facility	0.03061	34.80331
19	Hamisi	671	D19671	Kapsetik-Pri	School	0.07223	34.8414
19	Hamisi	672	D19672	Wawani-Catholic	Church	0.07339	34.83641
19	Hamisi	673	D19673	Gimariani-Pri	School	0.06861	34.82894
19	Hamisi	674	D19674	Jiruani-PAG	Church	0.08482	34.83627
19	Hamisi	675	D19675	Kipchekwen-PAG	Church	0.06929	34.81738
19	Hamisi	676	D19676	Kaptech-Disp	Facility	0.16463	34.82449
19	Hamisi	677	D19677	Makuchi-Friends	Church	0.15191	34.85645
19	Hamisi	678	D19678	Mwiliza-PAG	Church	0.15722	34.91636
19	Hamisi	679	D19679	Chepkoyai-D-O's Office	Admin's-Ofc	0.02298	34.73531
19	Hamisi	680	D19680	Tigoi-Pri	School	0.00674	34.72604
19	Hamisi	681	D19681	Boyani-Poly	Facility	0.01413	34.73489
19	Hamisi	682	D19682	Nyang'ori-Disp	Facility	0.02198	34.74407
19	Hamisi	683	D19683	Simbi-Pri	School	0.00418	34.74803
19	Hamisi	684	D19684	Kaimosi-Mission Hosp	Facility	0.12515	34.845
19	Hamisi	685	D19685	George-Khaniri-Pri	School	0.19452	34.92526
19	Hamisi	686	D19686	Kisasi-Friends	Church	0.10494	34.84987
19	Hamisi	687	D19687	Shamakhokho Friends	Church	0.1076	34.83185