INITIATIVE DÉVELOPPEMENT
association de solidarité internationale

GS 2514 MONITORING REPORT

1ST MONITORING REPORT

(EMISSION REDUCTIONS FOR THE CREDITING YEARS - 2014, 2015 & 2016)

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I. Introduction

A. Project Implementation

The project activity is implemented by Initiative Développement (henceforth "ID") in Brazzaville, Congo. The project aims at creating and organizing a supply and distribution chain for improved cook stoves in Brazzaville. Two models have been designed and are being promoted in the project - a big model for restaurants and a smaller model targeting individual households. The improved cook stoves promoted in the project can be used with both firewood and charcoal since those two fuels are widely used in Brazzaville. The improved cook-stove promoted by ID in Brazzaville are locally known as "Congo Mboté". The sales of the Congo Mboté were initiated from the year November 2013.

In the present monitoring report the emission reductions are taken into account from 1st August 2014 till 31st July 2016 (both the first and last date are inclusive).

Estimated in registered VPA-DD		**Monitoring report**	
Year	*Estimated VER's*	Year	VER's claimed
		2014	3029 tCO2eq
2014-2015	*5302 tCO2eq*	2015	6125 tCO2eq
2015-2016	*10 000 tCO2eq*	2016	4339 tCO2eq
Total	***15,302 tCO2eq***		**13,560 tCO2eq**

The sales of the improved cook stoves (Congo Mboté) in 2016 were not as high compared to the sales in the years 2014& 2015; therefore the difference in the VER's per vintage year.

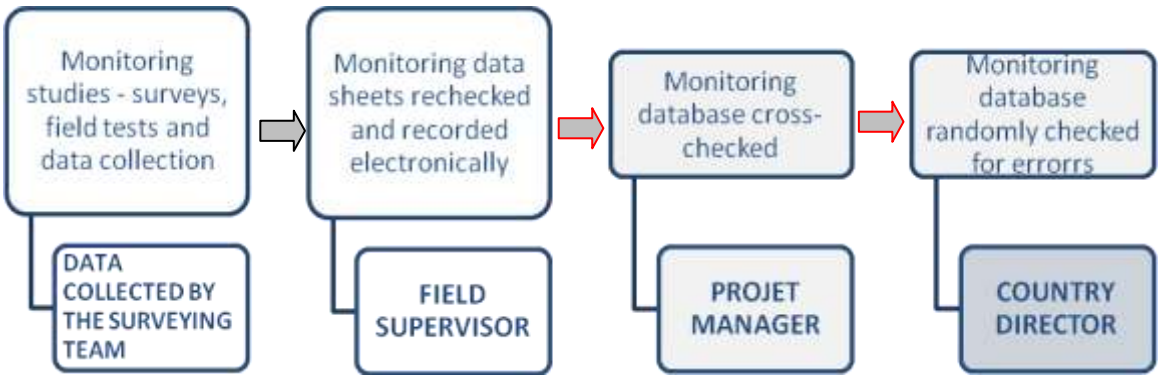
B. Monitoring methodology and structure of monitoring team

The monitoring surveys were carried out by the ID team based in Brazzaville. Local candidates are recruited and trained to carry out the monitoring surveys. A total of 4 survey members were trained by the ID. The details of the survey team and the training program is as follows –

Survey team	**Role**	**Monitoring team training**
1. Mr. MANDANGUI Brunel	Survey team supervisor	– 1st Jun'15 – 3rd Jun'15 – 5th Oct'16 – 7th Oct'16
1. Mr. MAMBA-MIKOUNGA Marcel	Surveying team member	
2. Ms. NATOUBA Dophina Ordalie, and	Surveying team member	
2. Mr. NKOUNKOU Valéry	Surveying team member	

The training programs were organized at the ID head office in Brazzaville and the training was animated by the then appointed Project Manager – Ms Julie Gaston.

The survey sheets were first checked by the field supervisor for any incomplete data or errors. If any data was missing or had errors, the survey member was requested to revisit the family if possible. The data was rechecked again by the project manager and finally rechecked by the country director of ID. The following image shows the 'cross-check procedure', carried out by the ID team for each monitoring.



The monitoring was comprised of three different surveys looking with increased precision at the energy usage of the improved cook-stove (Congo Mbote) users:

- The usage surveys was addressed to the largest sample and aimed at establishing the usage rate and the overall satisfaction of the Congo Mbote customers. This survey included people who stopped using their stove.
- The monitoring surveys focused on people who were using their stove and investigated their energy use patterns and the other benefits arising from the usage of the Congo Mbote.
- The Project Field Performance Test is a multiday survey performed on a sub sample of the previous survey during which fuel consumption is actually measured so that emission may be quantified.

The present report synthesizes the results from the above mentioned surveys and from the baseline surveys to give the reader an understanding of the actual climate and socio-economic impact of the project.

The survey dates are as follows –	
Monitoring Survey and Usage survey 2015	3rd June – 10th July 2015
Project field performance tests (KPT) 2015	3rd August – 7th September 2015
Monitoring Survey and Usage survey 2016	10th October - 15th November 2016

II. Continuous monitoring approach of total sales records and project databases

The ID team in Brazzaville has established a detailed sales record database. Each improved cook-stove has been allocated a unique identification number to avoid double counting. In accordance with the methodology monitoring requirements the sales record database is maintained and continuously updated with the relevant information such : sale date, place, name of customer, stove serial number, receipt number, size of the stove sold, intended usage (domestic/commercial).

The project database is continuously updated with each new sale of the improved cookstove. The database is cross-checked by the ID Country manager to assure that no stove is double counted. The sales receipt with incomplete are not taken into account in the emission reduction calculations.

The project database is available in the project supporting documentation. The pie chart below summarize the information derive from the analysis of the project database.

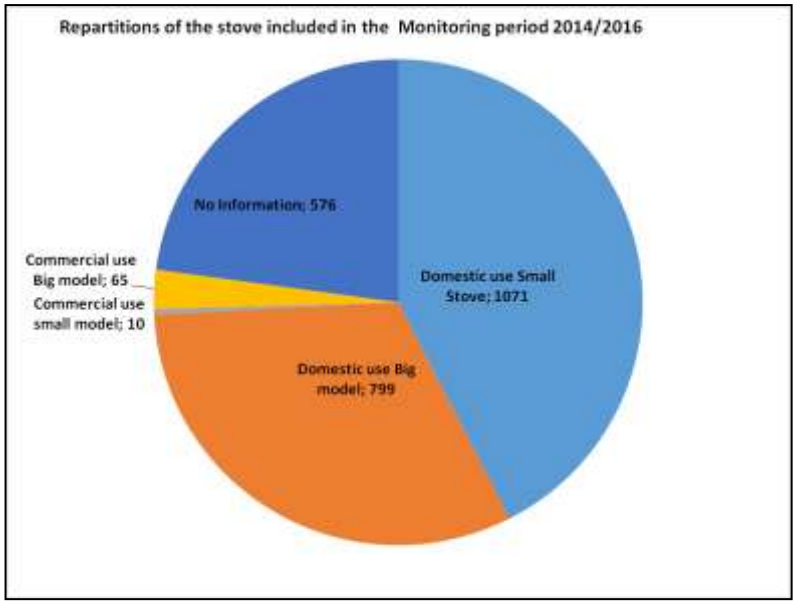


Figure 1: Ref ER calcs sheet 'project database'

The "no information" category includes stoves for which, at least one of the information was missing (either stove size or stove intended usage). Conservative simplification detailed in paragraph IV.B.2 and IV.C.1 show that this information is not critical for accurate emission reduction calculation.

Monitoring year	Total ICS sold and registered in project database	**Number of ICS[1] considered for VER's calculations**	
2014	1907	816	From 1st Aug 2014 till 31st Dec 2014
2015	2757	1151	From 1st Aug 2014 till 31st Dec 2015
2016	2757	2264	From 1st Jan 2015 till 31st July 2016

[1] **ICS** – Improved Cook-stove

From the period Nov'2013 till July 2015, a total of 1907 ICS's were sold and recorded in the project database and whereas for the period Nov'2013 till December 2016, a total of 2757 ICS's were sold and recoded.

The ICS's which were recorded incorrectly have not been taken into account and therefore a total of 2264 ICS's were taken into account for emission reduction calculations.

However, the improved stoves were not all sold before the start of each of the monitoring years. For each stove, we calculated the number of days they have been used and aggregated that in a number of full year stove equivalent. The 2757 stoves sold are equivalent to 2264 stoves being used during the whole year.

The ICS's stoves in the year 2013, are NOT included in the VER's calculations as a conservative approach, even if it has been observed during the monitoring years that the ICS's sold in 2013 were still in use by some the project beneficiaries.

The stove without unique identification numbers were excluded from the VER's calculations.

III. Usage rate of the stove and customer satisfaction

Usage rate information was acquired for stoves based on their age (date of sale) with a granularity of three month. The graph here under show how the usage rate evolve depending the on the age of the stove. The bar represents the number of stove surveyed for each age category. They are representative of the relative weight of each age category in the project database.

The weighted usage rate adopted for the monitoring year 2015 is **U_1=95.7%**
The weighted usage rate adopted for the monitoring year 2016 is **U_1=93.4%**
As a conservative approach, the usage rate of 2016 has been taken into account for the emission reduction calculation for each of the vintage year – 2014, 2015 & 2016.

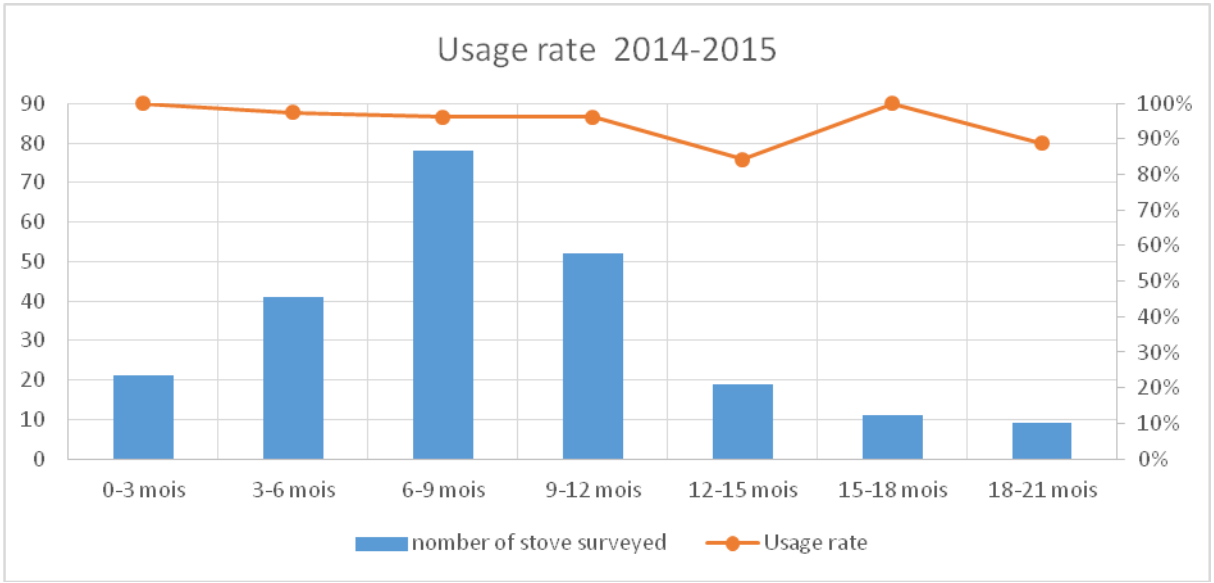


Figure 2: Ref ER calc sheet 'Usage rate'

IV. Data and parameters monitored

Data / Parameter:	**$P_{p,y}$**
Data unit:	kg/person-meal
Description:	Quantity of fuel that is consumed in project scenario p during year y
Source of data to be used:	Project FT, project FT updates
Value of data applied for the purpose of calculating expected emission reductions	$P_{1,1,kerosene}$= 0.004 $P_{1,1,firewood}$= 0.013 $P_{1,1,charcoal}$= 0.154 $P_{1,1,LPG}$= 0.015
Monitoring frequency:	Updated every two years
Description of measurement methods and procedures to be applied:	Fuel consumption will be measured with a Kitchen Performance Test and will be expressed in kg/person-meal
QA/QC procedures to be applied:	Systematic outlier identification procedures 90/30 precision check procedure
Any comment:	Refer – VER calculation sheet – 'KPT MT Combined analysis' , from cells Y73-AB73

Data / Parameter:	**$U_{p,y}$**
Data unit:	Percentage
Description:	Usage rate in project scenario p during year y
Source of data to be used:	Annual usage survey
Value of data applied for the purpose of calculating expected emission reductions	93.8%
Monitoring frequency:	Annual
Description of measurement methods and procedures to be applied:	Usage rate will be weighted to make sure each age group of the stove are adequately represented.
QA/QC procedures to be applied:	Transparent data analysis and reporting
Any comment:	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario. **As a conservative approach, the usage rate of 2016 has been taken into account for the emission reduction calculation for the all the vintage years– 2014, 2015 & 2016.**

Data / Parameter:	$\mathbf{N_{p,b,y}}$
Data unit:	Project technologies credited (units*day)
Description:	Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y
Source of data to be used:	Total sales record
Value of data applied for the purpose of calculating expected emission reductions	For the vintage year **2014** - $N_{baseline\ charcoal,\ project\ charcoal,1}$= 195 423.53 $N_{baseline\ fossil\ fuel,\ project\ charcoal,1}$= 22 548.87 $N_{baseline\ firewood,\ project\ charcoal,1}$= 4 295.02 $N_{baseline\ firewood,\ project\ firewood,1}$= 7 516.29 $N_{baseline\ charcoal,\ project\ firewood,1}$= 5 368.78 $N_{baseline\ other,\ project\ other,1}$= 2 147.51 For the vintage year **2015** - $N_{baseline\ charcoal,\ project\ charcoal,1}$= 388 259.53 $N_{baseline\ fossil\ fuel,\ project\ charcoal,1}$= 44 799.18 $N_{baseline\ firewood,\ project\ charcoal,1}$= 8 533.18 $N_{baseline\ firewood,\ project\ firewood,1}$= 14 933.06 $N_{baseline\ charcoal,\ project\ firewood,1}$= 10 666.47 $N_{baseline\ other,\ project\ other,1}$= 4 266.59 For the vintage year **2016** - $N_{baseline\ charcoal,\ project\ charcoal,1}$= 263569.33 $N_{baseline\ fossil\ fuel,\ project\ charcoal,1}$= 21020.87 $N_{baseline\ firewood,\ project\ charcoal,1}$= 9701.94 $N_{baseline\ firewood,\ project\ firewood,1}$= 4850.97 $N_{baseline\ charcoal,\ project\ firewood,1}$= 6467.96 $N_{baseline\ other,\ project\ other,1}$= 9701.94
Monitoring frequency:	Continuous
Description of measurement methods and procedures to be applied:	This value is based on the sale date of each individual stove. Stove that were sold after the beginning of the crediting period are discounted proportionaly to the time they were used during the crediting year.
QA/QC procedures to be applied:	Transparent data analysis and reporting
Any comment:	The total sales record is divided based on project scenario to create the project database

Data / Parameter:	α_y
Data unit:	fraction
Description:	Discount factor for VER if sample size is too small
Source of data to be used:	Baseline and monitoring Kitchen Performance Test
Value of data applied for the purpose of calculating expected emission reductions	0
Monitoring frequency:	Every two years
Description of measurement methods and procedures to be applied:	This parameter is derived from the statistical analysis of the result. If the sample size is enough to meet the precision requirement of the methodology, then α=0, otherwise this parameter will allow the calculation of the ER based on the lower bound of 90% one-sided interval.
QA/QC procedures to be applied:	Transparent data analysis and reporting
Any comment:	

V. Calculation of Emission Reduction

A. Overall methodology used

We followed guidance from the TPDDTEC methodology to calculate emission reduction:

- Identify among stove users the type of fuel they are using now and before they purchased the Congo Mbote so that scenario trajectories may be established
- Compute baseline fuel consumption in kg/person.meal for each scenario
- Compute project fuel consumption in kg/person.meal
- Calculate emission savings per person.meal for each combination of baseline/project scenario
- Calculate emission savings per stove per year by integrating average number of peron.meal/year
- Calculate overall project emission reduction by integrating the number of used stove in each category.

We adapted the equation proposed by the TPDDTEC methodology so that **specific** emission reductions are compared between project and baseline. This is important because the Congo Mbote comes in two sizes; the household who buy the large version of the Congo Mbote tend to have larger families than the one that buy the small version. The thermal efficiency and overall technology of the two version is however similar.

B. Baseline and project scenario trajectories

1. Type of fuel used

This pie chart shows the trajectory of each of the Congo Mbote user surveyed: the scenario they belonged to before they purchased the Congo Mbote and how the purchase of the Congo Mbote stove influenced their fuel usage habits.

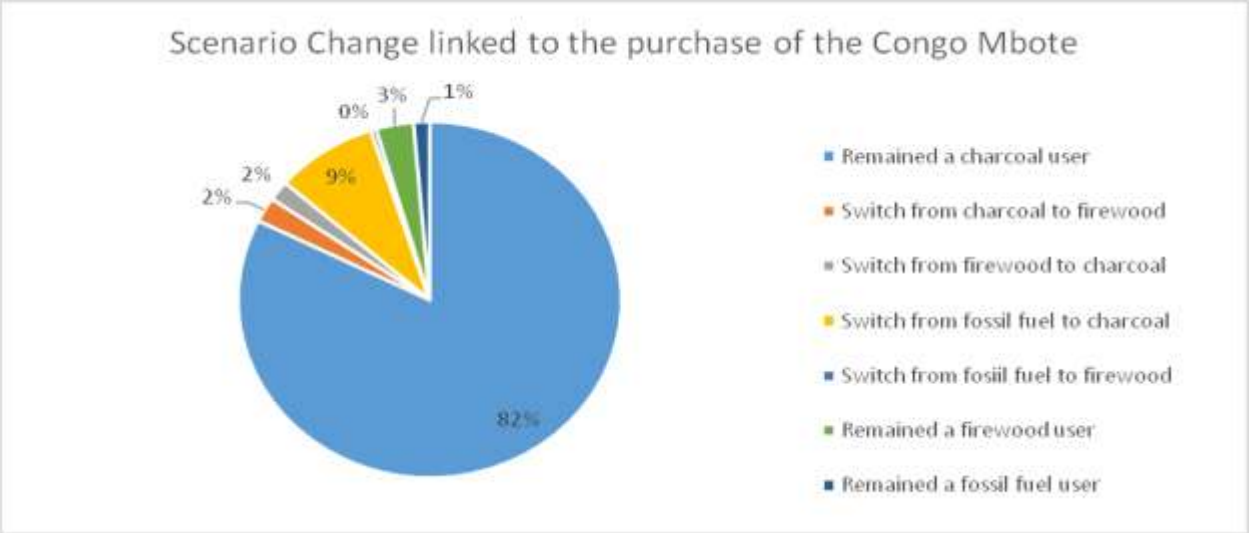


Figure 3: ER calc sheet 'monitoring survey charts 2015'

We can see that majority of users (82%) are charcoal users, they were using charcoal before their purchase and they continued after acquiring the Congo Mbote.

9% percent of the users used fossil fuel only before purchasing the stove and since they purchased it they are using charcoal. For this category of users the environmental impact is going to be negative since emission associated to charcoal are a lot higher than for LPG or Kerosene.

2% of the users switched from firewood to charcoal, for this category too the environmental impact is going to be negative.

0% of user switches from fossil fuel to firewood

2% switch from charcoal to firewood, for this category the environmental impact would be maximum but project firewood consumption has not been investigated due to the small percentage of users (see next section for more details).

2. Size of the stove used

For this first monitoring report, we surveyed separately household with different model to see what the fuel consumption would be. The result shows that the specific emission (in tCO2e per person*meal) is very similar (see table here under). So we included both model in the same scenario like allowed by the methodology.

	firewood kg/person.meal	charcoal kg/person.meal	kerosene kg/person.meal	LPG kg/person.meal	person *meal	emission tCO2e/(person.meal)	Reference
Big size	0.005	0.166	0.0006	0.0191	10.4	0.000432	ER calcs sheet 'KPT Project Large Stove'
Small Size	0.0209	0.154	0.0005	0.0096	8.2	0.000427	ER calcs sheet 'KPT Project Large Stove'

C. Integration of Congo Mbote stove in the household cooking system

In big urban centers like Brazzaville, household typically use a variety of fuel for their cooking needs. This chart show how often each type of fuel is used among the Congo Mbote user surveyed.

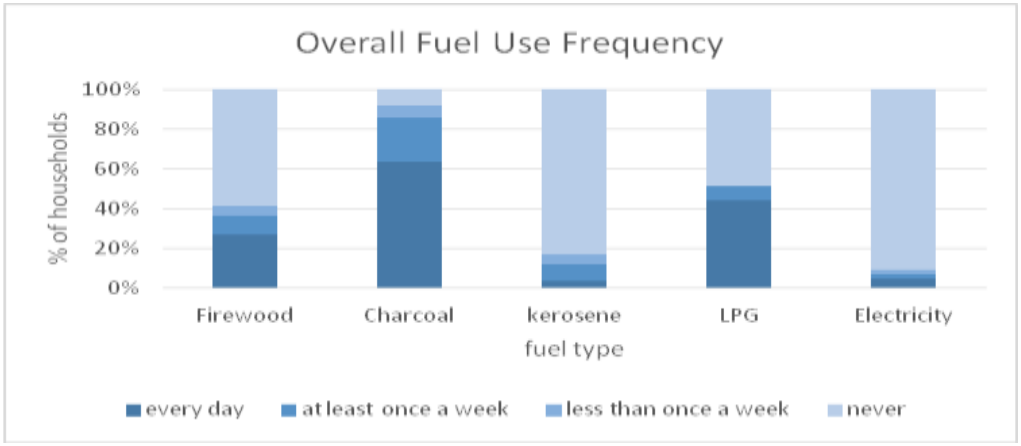


Figure 4: ER calc sheet 'Monitoring Survey Charts_2015'

The Congo Mbote stove may be used with either charcoal or firewood. So it is competing directly with traditional firewood and charcoal stoves in the household. We investigated in the monitoring survey how often each type of stove was used.

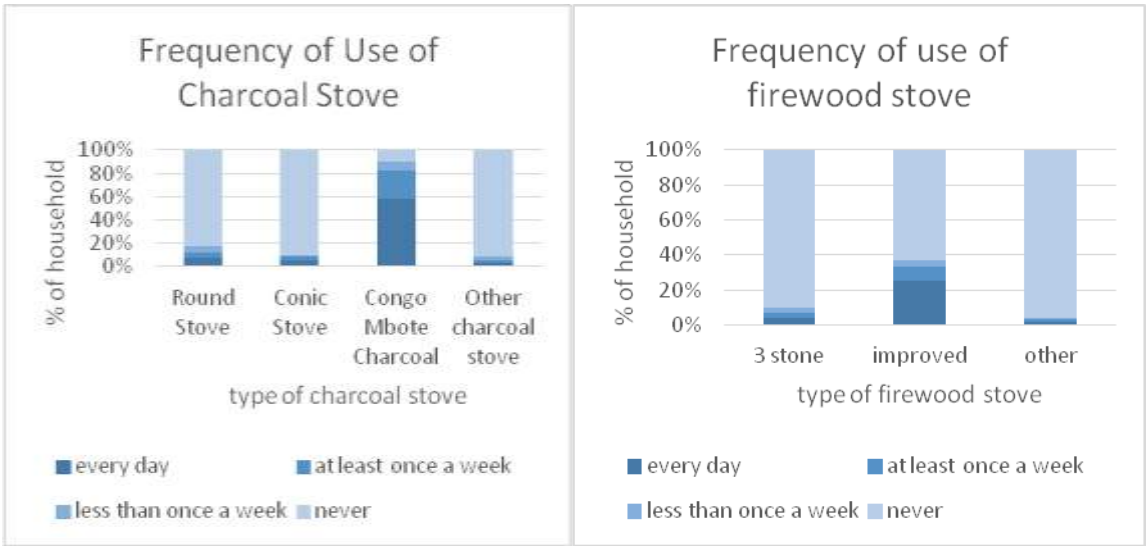


Figure 5: ER Calc sheet 'Monitoring Survey Charts_2015'

These chart shows that the Congo Mbote has mostly displaced the use of the traditional stoves.

D. Green House Gas Emissions per scenario

1. Summary of the conservative simplifications adopted

Because of the high number of baseline and project scenario some conservative simplifications were made. This allowed us to reduce the field work to something more manageable given the small size of the project.

	Baseline	**Project**
Domestic Charcoal	KPT	KPT
Domestic Firewood	KPT	Excluded from project (no emission reduction)***
Domestic Fossil Fuel	Assumed to be zero*	N/A
Restaurant Charcoal	Assumed to be same a Domestic Charcoal**	
Restaurant Firewood	Assumed to be same Domestic Firewood**	

* Baseline fossil fuel: because of the small number of people using only fossil fuel and the limited emission from this category it was not deemed worthwhile to do a full fledge KPT for this scenario. We deemed this category has no emission, this is conservative.

** The restaurant have a much more intensive usage of the stove and their fuel consumption is a lot higher than domestic households. So considering that one restaurant achieve the same amount of emission reduction as household is very conservative.

*** The monitoring survey show that 5% of the Congo Mbote customers use only firewood. 3% remained a firewood user and 2% switch from using charcoal in the baseline to firewood in the project. It was not deemed worthwhile to do a full fledge KPT for the category given the size of the project. As a result no emission reduction are claimed for this category. This is conservative.

2. Results for each individual scenario

The table here under show the results for each scenario surveyed. The KPT was undertaken during 4 consecutive days (72 hours period) during which firewood, charcoal, LPG and Kerosene fuel consumption were monitored as well as the number of meal cooked and person eating.

The emissions were calculated as per the TPDDTEC methodology and include CO2, N2O and CH4. The default NCV value and Emission Factors are available in the VPADD. Emissions are displayed in tCO2e per person.meal to make the result more comparable. Indeed the average number of person.meal in each scenario is different and would have prevented to compare the fuel consumption accurately.

Scenario	Average tCO2e/(person.meal)	Standard Deviation tCO2e/(person.meal)	Number of Survey
Baseline Firewood	0.0015	0.0007	31
Baseline Charcoal	0.0049	0.0017	57
Project Charcoal	0.0027	0.0016	70

3. Results for each scenario combination

The following equation is used to compute the bounds of the 90% one sided confidence interval:

$$CI\ bounds = \mu_{BL} - \mu_{PR} \pm 1.26 \sqrt{\frac{\sigma_{BL}^2}{n_{BL}} + \frac{\sigma_{PR}^2}{n_{PR}}}$$

With the following notation respectfully for the baseline and the project

σ : Standard deviation
μ: average
n: sample size

Baseline Scenario	Project Scenario	average of emission reduction in tCO2e/(person.meal)	emission reduction, low bound of the 90% one-sided confidence interval in tCO2e/(person.meal)	emission reduction, high bound of the 90% one-sided confidence interval in tCO2e/(person.meal)	VER per household (ton/household/year)
Charcoal	Charcoal	0.0022	0.0018	0.0026	7.32
Firewood	Charcoal	-0.0012	-0.0015	-0.0010	-4.04
Fossil Fuel	Charcoal	-0.0027	-0.0030	-0.0025	-9.17

For each of these three combinations of scenario the one sided 90% confidence interval is within +- 30% of the average, so the difference of the means maybe used to calculate emission reductions.

The VER per household were obtained by multiplying specific emission reduction in tCO2e per person*meal by the weighted average of number of person*meal per year derived from the project KPT.

E. Calculation of Greenhouse gas emissions reduction at the project level

To get to the VER at the project scale, the emission reduction for each category were multiplied by the number of stove sold, the usage rate and the percentage of users in each category

EMISSION REDUCTIONS FOR THE MONITORING YEAR 2014

Baseline Scenario	Project scenario	Full year stove equivalent	usage rate	% of users	number of household	emission reductions (tCO2e/year)
Charcoal	Charcoal	237300.00	93.8%	82.4%	672	3 668
Fossil fuel	Charcoal	237300.00	93.8%	9.5%	78	- 528
Firewood	Charcoal	237300.00	93.8%	1.8%	15	- 44
Firewood	Firewood	237300.00	93.8%	3.2%	26	-
Charcoal	Firewood	237300.00	93.8%	2.3%	18	-
others		237300.00	93.8%	0.9%	7	-
					Total	**3095**

EMISSION REDUCTIONS FOR THE MONITORING YEAR 2015

Baseline Scenario	Project scenario	Full year stove equivalent	usage rate	% of users	number of household	emission reductions (tCO2e/year)
Charcoal	Charcoal	417458.00	93.8%	82.4%	948	7 258
Fossil fuel	Charcoal	417458.00	93.8%	9.5%	109	- 1 045
Firewood	Charcoal	417458.00	93.8%	1.8%	21	- 88
Firewood	Firewood	417458.00	93.8%	3.2%	36	-
Charcoal	Firewood	417458.00	93.8%	2.3%	26	-
others		417458.00	93.8%	0.9%	10	-
					Total	**6125**

EMISSION REDUCTIONS FOR THE MONITORING YEAR 2016

Baseline Scenario	Project scenario	Full year stove equivalent	usage rate	% of users	number of household	emission reductions (tCO2e/year)
Charcoal	Charcoal	315313.00	93.8%	83.6%	248	4 998
Fossil fuel	Charcoal	315313.00	93.8%	6.7%	20	- 497
Firewood	Charcoal	315313.00	93.8%	3.1%	9	- 162
Firewood	Firewood	315313.00	93.8%	1.5%	5	-
Charcoal	Firewood	315313.00	93.8%	2,1%	6	-
others		315313.00	93.8%	3.1%	9	-
					Total	**4339**

Total Emission reductions 2014	**3095 tCO2e**
Total Emission reductions 2015	**6125 tCO2e**
Total Emission reductions 2016	**4339 tCO2e**

Overall socio-economic impacts from the project

These two chart were established independently for traditional charcoal stove user and Congo Mbote stove users respectively. In all categories the usual issues associated with cooking with dirty fuel are greatly mitigated.