The Gold Standard

Quantification of climate related emission reductions of Black Carbon and Co-emitted Species due to the replacement of less efficient cookstoves with improved efficiency cookstoves

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Glossary

SLCFs/ SLCPs	Short-lived climate forcers (SLCFs)/Short-lived climate pollutants (SLCPs) include compounds such as black carbon (BC), methane (CH_4), tropospheric ozone (O_3), and many hydrofluorocarbons (HFCs). These compounds have short lifetimes in the atmosphere compared to long-lived GHGs (LL-GHGs). Although their concentrations/loadings can be elevated by human-related activities and emissions, these compounds do not accumulate in the atmosphere over multi-decadal to centennial time scales and longer; their life-times in the atmosphere are shorter lived, however, their effects on climate are significant. Cookstoves fueled by solid fuels are one of the key contributors to SLCPs such as BC, CH_4 and tropospheric ozone (O_3) precursors like carbon monoxide (CO) and volatile organic compounds (VOCs). These are compounds that exert positive radiative forcing on the lower atmosphere and surface.
Other Co-emitted Species	The incomplete combustion of solid fuels also releases other pollutants such as organic carbon (OC), nitrogen oxides (NOx) and sulfur dioxide (SO_2), which react in the atmosphere to form sulfate aerosols (SO_4^{-2}). Although the methodology attributes cooling effect to the organic carbon (OC), recent research suggests that the brown carbon (see definition below) component of OC emissions absorbs solar radiation strongly and can potentially offset the cooling effect assumed for organics by IPCC models. The sulfate aerosols exert a cooling effect on the lower atmosphere and surface, as does as does NOx. Note that in this methodology only the effects of BC and co-emitted species - which include OC, CO, VOCs and sulfur species are accounted for and quantified.
Black Carbon (BC)	Black carbon is a solid form of mostly pure carbon that absorbs solar radiation (light) at all wavelengths. BC is, by mass one of the most effective solar-absorbing aerosols. It is sometimes referred to as soot.
Organic Carbon (OC)	Organic carbon generally refers to the mix of compounds containing carbon along with another element such as hydrogen or oxygen. OC is a product of incomplete combustion, or is formed through the oxidation of VOCs in the atmosphere.
Brown Carbon	Brown carbon (BrC) refers to a class of OC compounds that absorb ultraviolet (UV) and visible solar radiation. Like BC, BrC leads to global warming. Note that BrC is not accounted for in this methodology.
Volatile Organic Compounds (VOCs) and Non- Methane Volatile Organic Compounds (NMVOCs)	Volatile organic compounds (VOCs) have short atmospheric lifetimes (fractions of a day to months) and limited direct effect on radiative forcing. When referring to the volatile organic compounds other than methane, they are called non-methane volatile organic compounds (NMVOCs).VOCs influence climate through their production of organic aerosols and their involvement in photochemistry, i.e. production of secondary tropospheric O_3 in the presence of NOx and light.

Section I: Source and Applicability

This methodology is applicable to project activities that introduce efficient cookstove technologies and/or practices or switch from non-renewable to renewable biomass for meeting thermal energy requirements for cooking regimes. This document describes the quantification approach to be used in the calculation of emissions reductions from black carbon (BC) and other co-emitted species, including organic carbon (OC), carbon monoxide (CO), non-methane volatile organic carbons (NMVOCs) and sulfates. The methodology is applicable for project activities that will result in emissions reductions of BC and co-emitted species, primarily from lower levels of fuel consumption and/or changes in emission factors (g/kg of fuel) that can be achieved through use of a more efficient project technology and/or fuel as compared to baseline technology and/or fuel. The methodology described is to be used in conjunction with the Gold Standard methodology, **Technologies and Practices to Displace Decentralized Thermal Energy Consumption (TPDDTEC)**. Therefore the quantification approach and monitoring requirements for BC and co–emitted species are aligned, wherever possible, with the approach used in the TPDDTEC methodology.

The project activities covered by this methodology must conform to the project eligibility criteria defined in the TPDDTEC methodology. The TPDDTEC methodology outlines the minimum criteria for baseline and project technology, including:

- Project cookstoves must be in compliance with minimum IWA emissions performance tier -3 criteria for high power PM 2.5 and low power PM 2.5[1]
- Useful thermal output capacity of the project technology needs to be less than 150 kW per project technology
- Defined project boundary are required
- Incentive mechanism(s) must be included discourage the ongoing parallel use of the baseline technology
- Clear description of the ownership rights of carbon credits generated from project technology
- Evaluation criteria must be established to avoid double counting of same project technology in other CDM/voluntary activities
- Specific requirements for fuel switching activities as per the TPDDTEC methodology should be complied

Please refer to the TPDDTEC methodology for further details of these applicability conditions.

Section II: Baseline Methodology

1. Project Boundary

The project developer must provide clear descriptions of the project boundary, target area, and the fuel production and collection area[2].

2. Emissions Sources Included in the Project Boundary

Emissions of BC and co-emitted species can occur during fuel production, transport and consumption. This methodology only focuses most attention on projects for which emissions of BC and co-emitted species come from fuel consumption. Upstream emissions, which include emissions from fuel processing and transportation, may become relevant where there is a change in fuel type from the baseline to project

[1] A project can be registered with designed value for "high power PM and low power PM" if evidence is provided prior to first issuance of the Certified Outcome Statement. Please refer to Table 4.6 IWA Performance tiers, Water Boiling Test protocol for details, available at http://cleancookstoves.org/technology-and-fuels/testing/protocols.html

[2] For a cookstove project, the project boundary is the physical, geographical extent of the sites / households using project cookstoves and also includes baseline and project fuel collection area. The target area can be a single country or extend across multiple adjacent countries in a single sub-region where usage of the considered baseline cookstove practice is found to be prevalent and relatively uniform. The target area is defined as the outer limit for the project boundary that includes the target population.

scenario. These upstream emissions must be included in a fuel switch scenario, unless demonstrated and justified to be the same or less in a project scenario compared to the baseline scenario.

Baseline emissions of any gases/pollutants outlined below could be omitted for purposes of simplification if they are:

- Justified to cause warming; OR
- Demonstrably negligible; OR
- Not applicable to the identified baseline scenario.

All project emissions from the gases/pollutants outlined below must be accounted for, unless:

- Justified to cause cooling; OR
- Demonstrably negligible; OR
- Not applicable to identified project scenario.

Emissions must be well documented and based on publicly available and verifiable data:

	Source	Gas/Pollutant*	Included?	Justification / Explanation
Baseline	Thermal energy	BC	Yes	Important contribution to baseline emissions
		OC	Yes	Important contribution to baseline emissions
		CO	Yes	May be important contribution to baseline emissions
		NO_X	Yes	May be important contribution to baseline upstream emissions. It is excluded from cooking activities due to negligible emissions, however it shall be accounted for upstream emissions.
		NMVOCs	Yes	May be contribution to baseline emissions
		Sulfates	Yes	May be significant contribution to baseline emissions for some type of fuels
Project	Thermal energy	BC	Yes	Important contribution to project emissions
		OC	Yes	Important contribution to project emissions
		CO	Yes	May be important contribution to project emissions
		NO_X	Yes	May be important contribution to project upstream emissions. It is excluded from cooking activities due to negligible emissions, however it shall be accounted for upstream emissions.
		NMVOCs	Yes	May be important contribution to project emissions
		Sulfates	Yes	May be significant contribution to project emissions for some types of fuels

* Methane is also a short-lived climate pollutant (SLCP); however, methane is already considered under the Kyoto Gases category, where it contributes to the calculation of tCO_2e and is eligible for GHGs offsetting purpose. For the purposes of this quantification methodology methane is therefore not included.

3. Baseline Scenario

A baseline scenario is defined by the typical baseline fuel consumption pattern and technology use in the population that is targeted to adopt the new project technology. Hence, this “target population” is used to calculate the representative baselines for the project activity.

4. Project Scenario

A project scenario is defined by the fuel consumption and technology usage of end-users within a target population that have adopted and are using the new project technology. Climate-related emission reductions are accounted for by comparing fuel consumption in a project scenario to the applicable baseline scenario. For project activities that use different technologies or target populations that consume significantly different fuels, project developers must have clear and distinct baseline and project scenarios for each.

5. Baseline Studies

As outlined above, a baseline scenario is defined by the typical fuel consumption patterns and technology use among the target population prior to adopting the project technology. However, a project activity may have more than one applicable baseline scenario for end users with different fuel consumption and use characteristics.

The project developer must conduct the following baseline studies for each baseline scenario:

I. Baseline survey of target population characteristics. This survey needs to provide critical information on the target population, baseline technology use, fuel consumption and use, leakage and sustainable development indicators.
II. Baseline Performance Field Test (BFT) of fuel consumption and use (e.g. Kitchen Performance Test (KPT) in the case of cookstoves)

6. Project Studies

A project scenario is defined by the adoption of project technologies by end users within a target population within the project area. The project developer must conduct a project survey of the target populations characteristics and project performance field test (PFT) of fuel consumption for each project scenario. This must be done in accordance with the schedule set out in Annex 5 of the TPDDTEC methodology. These project studies have the same requirements as the baseline studies, but the project survey and PFT need to be conducted with end users representative of the project scenario target population and currently using the project technology.

7. Calculation of Emission Reductions for BC and Co-emitted Species

The emission reductions of BC and co-emitted species are quantified by comparing the fuel quantity and emissions factor for a given project scenario to those for the applicable baseline scenario. The overall reductions achieved by the project activity in year y are calculated as follows:

$$ER_{BC\&CSs,y} = \sum_{b,p} \left(N_{p,y} * U_{p,y}\right) * (ER_{BCeq,y})/1000 \quad \textbf{(1)}$$

where,

$ER_{BR\&CSs,y}$	Emissions reduction of BC and co-emitted species ($kg_{BC}e$)
$\sum_{b,p}$	Sum over all relevant (baseline b and project p) couples
$N_{p,y}$	Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y
$U_{p,y}$	Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate (fraction)
$ER_{BC}e_{y,}$	Reduction in emissions of BC and co-emitted for an individual technology of project p and fuel use against an individual technology of baseline b and fuel use in year y ($kg_{BC}e$)

The other species, primarily OC, CO, NMVOCs and sulfates, are accounted for under categories for co-emitted species. The following equation is applied to quantify the emissions reductions of BC and co-emitted species per cookstove unit.

$$ER_{BCe,y} = \sum_{x\in\{BC,OC,C?,NMVOCs,\,SO4^{-2}\}} (f_{eq,x} * (P_{b,y} * EF_{b,x,y} * AF_{b,x} - P_{p,y} * EF_{p,x,y} * AF_{p,x})) \quad \textbf{(2)}$$

where,

$P_{b,y}$	Quantity of fuel consumed in baseline scenario b during year y, in kg per unit per day
$P_{p,y}$	Quantity of fuel consumed in project scenario p during year y, in kg per unit per day

$f_{eq,x}$ BC equivalent conversion factor for species x
$EF_{b,x,y}$ Emission factor for species x for baseline technology b in year y, in g/kg fuel consumed
$EF_{p\_x,y}$ Emission factor for species x for project technology p in year y, in g/kg fuel consumed
$AF_{b,x}$ Adjustment factor to account for any bias in laboratory vs. field testing to determine species x emission factor for baseline technology. If emission factors are determined by carrying out laboratory tests or field tests apply 1.0 as the adjustment factor (see below).
$AF_{p,x}$ Adjustment factor to account for any bias in laboratory vs. field testing to determine species x emission factor for project technology. If emission factors are determined by carrying out laboratory tests or field tests apply 1.0 as the adjustment factor (see below).

The Adjustment Factor ($AF_{b,x}$ and $AF_{p,x}$) to account for any bias in laboratory vs. field emission factor and fuel variability (moisture content/mix) will be updated following planned review of pending/future studies on BC and co-emitted species. The project developers are encouraged to submit relevant information regarding BC and co-emitted species emissions factors for GS review.

The methodology allows BC and co-emitted species emission factors to be determined through laboratory or field-testing. The laboratory-based emission factors may vary significantly as compared to those determined through field measurements. Therefore, the laboratory-based emission factors should be adjusted for any bias in laboratory vs. field-testing by applying adjustment factors.

BC equivalent conversion factor:
The BC equivalent conversion factor for species x is a ratio of the GWP of co-emitted species to the GWP of BC for the 20-year time horizon as calculated by the IPCC on a global basis. The global IPCC values are provided in the next section. The project developer can apply the regional GWP values or sector specific GWP values for BC and co-emitted species. The regional (country or group of countries) GWP values must be derived from peer-reviewed publications. The regional values will be subject to further review and approval from Gold Standard. The approved regional values can be applied for subsequent projects developed in the same region and for the same sector.

8. Data and Parameters Not Monitored over the Crediting Period

The parameters that are fixed ex-ante (not required to be monitored over the crediting period) are listed in the table below.

Data / Parameter:	$f_{eq,x}$
Data unit:	Fraction
Description:	Ratio of GWP- 20 of co-emitted species to the GWP-20 of BC
Source of data:	IPCC global average defaults or regional values based on credible published literature
Comment (if any):	-

Species	GWP_20 (IPCC, 2013)[3]	$f_{eq,x}$ (i.e., $GWP_{species,x}/GWP_{BC}$)
BC	2421	1.000
OC	-244	-0.100
CO	5.9	0.002
VOCs	14	0.006
SO_4^{-2}	-141	-0.058

A negative sign indicates that emission of the species leads to cooling of the surface-troposphere system.

Data / Parameter:	$AF_{b,x}$
Data unit:	-

[3] IPCC, 2013, Table 8.SM.17, Metric to support Figures, Chapter 8 Anthropogenic and Natural Radiative Forcing, *Climate Change 2013: The Physical Science Basis*

Description:	Adjustment factor to account for any bias in laboratory vs. field -testing for species "x" emission factor for baseline technology. - If emission factors are determined by carrying out laboratory tests or field tests apply 1.0 as adjustment factor in either case
Source of data:	-
Comment (if any):	-

Data / Parameter:	**$AF_{p,x}$**
Data unit:	-
Description:	Adjustment factor to account for any bias in laboratory vs. field testing to determine the species "x" emission factor for project technology. - If emission factors are determined by carrying out laboratory tests or field tests apply 1.0 as adjustment factor in either case
Source of data:	-
Comment (if any):	-

Section III: Monitoring Methodology

1. Monitoring Procedure

A total sales record and project database must be continuously maintained. For each project scenario a monitoring survey and usage survey must be conducted annually to update monitoring parameters over the crediting period of the project. For each baseline and project scenario the BFT and PFT must be updated every two years, respectively, except in cases of a fixed baseline where there is no need for updating BFT. Further guidelines for monitoring, performance tests and other studies are provided in the TPDDTEC methodology.

If fuelwood is identified as the baseline fuel and /or project fuel, the project developer may choose to monitor $PM_{2.5}$ as the proxy monitoring parameter[4] for OC. In such cases, the OC emissions shall be determined using the following equation.

$$EF_{OC} = (EF_{PM2.5} - EF_{BC})/1.8 \quad \textbf{(3)}$$

where,

EF_{OC} Emission factor for OC for baseline and/or project technology p in year y in g/kg fuel consumed
$EF_{PM2.5}$ Emission factor for $PM_{2.5}$ for baseline and/or project technology p in year y in g/kg fuel consumed
EF_{BC} Emission factor for BC for baseline and/or project technology p in year y in g/kg fuel consumed

2. Data and Parameters Monitored Over the Crediting Period

Parameter	Details	Unit	Reference/Source
As per TPDDTEC methodology			
$P_{b,y}$ (only	Quantity of fuel that is	kg/unit-day, kg/person-	Baseline field tests (FT),

[4] The PM emission factor agrees well with the sum of organic matter (OM) and Black Carbon (BC) emission factors, where organic matter represents organic carbon and associated elements. For fuelwood typical OM to OC ratio varies between 1.5 and 2.1. An average value i.e., 1.8 of this range is included here. For details please refer to

i. Roden CA, Bond TC, Conway S, Benjamin A, Pinel O (2006) Emission factors and real-time optical properties of particles emitted from traditional wood burning cookstoves. Environmental Science & Technology 40: 6750-675
ii. MacCarty N, Ogle D, Still D, Bond T, Roden C (2008) A laboratory comparison of the global warming impact of five major types of biomass cooking stoves. Energy for Sustainable Development 12: 56-65
iii. Johnson M, Bond TC, Lam N, Weyant C, Chen W, Ellis J, Modi V, Joshi Sandeep, Yagnaraman M, Pennise D (2011); In-Home Assessment of Greenhouse Gas and Aerosol Emissions from Biomass Cookstoves in Developing Countries. USAID, 2011

applicable if baseline is not fixed)	consumed in baseline scenario b during year y	meal, etc.	baseline FT updates, and any applicable adjustment factors
$P_{p,y}$	Quantity of fuel that is consumed in project scenario p during year y	kg/unit-day, kg/person-meal, etc.	Project FT, project FT updates, and any applicable adjustment factors
$U_{p,y}$	Usage rate in project scenario p during year y	%	Monitoring surveys
$N_{p,y}$	Project technologies credited (units)	Technologies in the project database for project scenario p through year y	Total sales record

Data / Parameter:	$EF_{b,BC}$
Data unit:	g/kg_fuel
Description:	BC emission factor arising from the fuel consumption in the baseline scenario
Source of data:	Laboratory or field test
Monitoring frequency:	Ex-ante fixed for a given crediting period
QA/QC procedures:	Transparent data analysis and reporting
Comment (if any):	A representative emission factor for each baseline technology type and fuel that is being compared for project crediting

Data / Parameter:	$EF_{p,BC}$
Data unit:	g/kg_fuel
Description:	BC emission factor arising from the project technology and fuel consumption in the project scenario
Source of data:	Fixed Stoves: 1st test: Laboratory test to measure emission factor (g/kg of fuel) with field measurements of BC concentration (g/m^3) OR field tests to measure emission factor (g/kg of fuel). 2nd test and subsequent field tests: Field measurements of BC concentration (g/m^3) OR field tests to measure emission factor (g/kg of fuel) Portable Stoves: The test options as mentioned for fixed stoves OR following approach can be used: 1st test: Laboratory test to measure emission factor (g/kg of fuel) 2nd test and subsequent tests: Laboratory test to measure emission factor (g/kg of fuel) for a sample of five randomly selected cookstoves in use of specific age – group. Emission factor once determined for specific age group can be used for same cookstove models installed at later stage with same age group
Monitoring frequency:	Updated every two years, or more frequently
QA/QC procedures:	Transparent data analysis and reporting
Comment (if any):	A representative emission factor for each project technology type and fuel that is being compared for project crediting

Data / Parameter:	$EF_{b,OC}$
Data unit:	g/kg_fuel
Description:	OC emission factor arising from the fuel consumption in the baseline scenario
Source of data:	Laboratory or field test
Monitoring frequency:	Ex-ante fixed for a given crediting period
QA/QC procedures:	Transparent data analysis and reporting
Comment (if any):	OC emission factor for baseline technology can be derived following the options

	below. 1. Direct measurement: The OC emission factor can be determined by testing a representative sample of the baseline technology for OC in the laboratory or field following the established test methods. 2. Indirect measurement (for fuelwood only): The OC emission factor can established by testing a representative sample of baseline technology and fuel for $PM_{2.5}$ (g/kg_fuel) in laboratory or in field following the established test methods. The OC emission factor can be derived following the eq 3 mentioned above in section 3.1.

Data / Parameter:	$EF_{p,OC}$
Data unit:	g/kg_fuel
Description:	OC emission factor arising from the project technology and fuel consumption in project scenario
Source of data:	Direct or indirect measurement for OC emission factor for specific type of cookstoves as mentioned below. <u>Fixed Stoves:</u> 1st test: Laboratory test to measure emission factor (g/kg of fuel) with field measurements of concentration (g/m^3) OR field tests to measure emission factor (g/kg of fuel). 2nd test and subsequent tests: Field measurements of concentration (g/m^3) OR lab OR field tests to measure emission factor (g/kg of fuel) <u>Portable Stoves:</u> The test options as mentioned for fixed stoves OR following approach can be used: 1st test: Laboratory test to measure emission factor (g/kg of fuel) 2nd test and subsequent tests: Laboratory test to measure emission factor (g/kg of fuel) for a sample of five randomly selected cookstoves in use of specific age – group. Emission factor once determined for specific age group can be used for same cookstove models installed at later stage with same age group
Monitoring frequency:	Updated every two years, or more frequently
QA/QC procedures:	Transparent data analysis and reporting
Comment (if any):	OC emission factor for project technology can be derived following the options below. 1. Direct measurement: The OC emission factor can be determined by testing a representative sample of project technology for OC in the laboratory or field following the established test methods. 2. Indirect measurement (for fuelwood only): The OC emission factor can be determined by testing a representative sample of project technology for $PM_{2.5}$ (g/kg_fuel) in the laboratory or field following the established test methods. The OC emission factor can be derived following the eq 3 mentioned above in section 3.1

Data / Parameter:	$EF_{b,CO,\ NMVOCs,\ SO4^{-2}}$
Data unit:	g/kg_fuel
Description:	Co-emitted species (CO, NMVOCs, SO_4^{-2}) emission factor arising from the fuel consumption in baseline scenario
Source of data:	Laboratory test or field test
Monitoring frequency:	Ex-ante fixed for a given crediting period
QA/QC procedures:	Transparent data analysis and reporting

Comment (if any):	A representative emission factor for each baseline technology type and fuel use that is being compared for project crediting

Data / Parameter:	$EF_{p, CO, NMVOCs, SO4^{-2}}$
Data unit:	g/kg_fuel
Description:	Co-emitted species (CO, NMVOCs, SO_4^{-2}) emission factor arising from project technology and fuel consumption in project scenario
Source of data:	Fixed Stoves: 1st test: Laboratory test to measure emission factor (g/kg of fuel) with field measurements of species x concentration (g/m^3) OR field tests to measure emission factor (g/kg of fuel). 2nd test and subsequent tests: Field measurements of species x concentration (g/m^3) OR field tests to measure emission factor (g/kg of fuel) Portable Stoves: The test options as mentioned for fixed stoves OR following approach can be used: 1st test: Laboratory test to measure emission factor (g/kg of fuel) 2nd test and subsequent tests: Laboratory test to measure emission factor (g/kg of fuel) for a sample of five randomly selected cookstoves in use of specific age – group. Emission factor once determined for specific age group can be used for same cookstove models installed at later stage with same age group
Monitoring frequency:	Updated every two years, or more frequently
QA/QC procedures:	Transparent data analysis and reporting
Comment (if any):	A representative emission factor for each project technology type and fuel that is being compared for project crediting

3. Determining Emission Factors for BC and OC

The BC and co-emitted species emission factors for baseline and project technology are to be determined by carrying out field test / laboratory test or a combination of laboratory and field based measurements, following WBT, CCT or KPT protocols. The same testing protocol shall be followed for baseline and project technologies and throughout the crediting period. The various options for measurements are depicted in the figure on next page. The emissions factor for co-emitted species can be estimated using the approach defined for measuring BC.

Calculating updated emission factors for 2nd and subsequent tests: If using field-based measurements of concentrations of species "x" to estimate the emission factor for the year y, multiply the ratio of concentration of species "x" (g/m^3) for year y and first concentration test, by the emissions factor for species "x" (g/kg_fuel) as determined in the first test. Where portable project cookstoves are employed a sample of five randomly selected cookstoves in use may be sent for lab testing of emission factors for all species considered.

If a lab-based measurement is used, then the emission factor shall be derived based on at-least five tests each for individual baseline and project stove technologies. If the results from the five tests do not meet the 90/30 precision level either the sample size must be increased or the mean values shall be adjusted for the error by applying lower and upper bound of the one-sided confidence interval for baseline and project emissions factors, respectively.

To carry out the field tests for BC, $PM_{2.5}$ and other species concentrations/emission factors, the minimum sample size must be greater than 20. The project developer needs to demonstrate that the 90/30 precision level is met so the mean value can be applied. If the results do not meet the 90/30 precision level either the sample size must be increased or the mean values shall be adjusted for the error by applying lower and upper bound of the one-sided confidence interval for baseline and project emissions factors, respectively. For further guidelines, refer to Annex-5 of the TPDDTEC methodology.

Note that the project technology must not lead to higher emissions of $PM_{2.5}$ and BC as compared to the baseline situation. If a project activity fails to meet this condition during crediting period, the project activity would not be eligible for claiming BC and co-emitted species emission reduction benefits.

If the baseline cookstove remains in use in parallel with the project cookstove, corresponding emissions must of course be accounted for as part of the project emissions. The parallel use of baseline-stove shall be determined based on the number of meals cooked using baseline stove through monitoring surveys. The project emissions factor shall be estimated by applying the weighted average of emissions factor as per the meals cooked using baseline and project cookstoves.