SD VISta Methodology

SDVM001

TIME SAVINGS FROM IMPROVED COOKSTOVES

Version 1.0

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Sectoral Scopes 4 & 10

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CONTENTS

1 SOURCES

No relevant modules or tools are used by the methodology.

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

2.1 Methodology Description

This methodology provides procedures to estimate the time savings achieved by replacing inefficient baseline cooking stoves in the household with improved cookstoves (ICS). The project activity includes providing new improved cookstoves (ICS) or retrofitting existing installations. Examples of improved cookstoves include all types of fixed, portable "rocket" stoves and homemade cookstoves with a thermal efficiency at or above 25 percent, which require only small-volume fuels such as small branches, twigs, dung, and crop residues. Time savings are categorized into two parts: reduction of time spent for (i) cooking activity, and (ii) fuel collection (see Definitions for full description).

Although not quantified as part of this methodology, positive health outcomes are a likely additional benefit derived from projects applying this methodology, and may be independently quantified as a claim using SD VISta.

2.2 Asset Description

Table 1: Asset(s) That Would Be Created by Projects Using the Proposed Methodology

Time Savings Unit (TSU)	
Asset Description	The reduction in time spent on cooking activity and fuel collection
Unit	Year
Sustainable Development Goal(s)	SDG targets 5.4 and 8.4
Assets may be used for offsetting	No
Comments	See cooking activity and fuel collection in the Definitions for a complete list of the actions from which time savings are derived.

This methodology permits two approaches for the generation of time savings units:[1]

1) **Asset Accounting Option 1:** Time savings units are generated based on projected time savings following the initial verification of ICS installation. The project may generate time savings units for the projected time savings that will be achieved during the five years following the initial verification. The project may project time savings for up to five further years following a second verification.

2) **Asset Accounting Option 2:** Time savings units are generated after monitored results have been verified. The frequency of verification is determined by the project proponent.

Further detail on each approach is given in Sections 8 and 9.

2.3 Asset Crediting Period

The crediting period for the project must be either 7 years, twice renewable for a total of 21 years, or 10 years fixed.

The asset crediting period must not exceed the crediting period of the project under the relevant GHG emission reduction program, if applicable.

3 DEFINITIONS

Batch
A population of project devices installed during a given period, which may not exceed one year. Multiple batches may be installed within a single calendar year, and the date of commissioning of the last project device of the batch will be used as the commissioning date for the entire batch.

Biomass fuel
Organic material, which originates from, for example, forest, croplands, grasslands, and/or animal waste, that is used to produce heat or electricity

Cooking activity
The actions taken to thermally cook food or drink while on a heat source. Does not include the preparation of ingredients (e.g., chopping, peeling) or food preparation activities that do not require a heat source (e.g., combining ingredients into a final dish).

[1] The project proponent must select an approach prior to the first verification and use the same approach throughout the project crediting period.

Fuel collection
The actions taken to obtain and prepare biomass fuel to be used for cooking activities. The actions include cutting, collecting, transporting, purchasing, and preparing biomass fuel. Biomass fuel preparation includes activities such as drying biomass and making charcoal.

Improved cookstove (ICS)
Biomass fuel stove designed to improve energy efficiency, reduce smoke from the indoor living space, and lessen the drudgery of cooking activity and fuel collection. For the purpose of this methodology, an improved cookstove must have a thermal efficiency of at least 25 percent.

Inefficient baseline stove
Conventional/traditional solid-fuel cooking solutions with no improved combustion air supply or flue gas ventilation such as open fire, three-stone fire, unvented mud/clay "U" shaped stove, and basic charcoal stove. For the purpose of this methodology, inefficient baseline stoves are those with a thermal efficiency of less than 25 percent.

Retrofit
Modification of an inefficient baseline stove where essential parts of the stove are replaced or modified to meet the definition of improved cookstove.

4 APPLICABILITY CONDITIONS

This methodology applies to project activities that replace inefficient baseline stoves with improved cookstoves (ICS) through the distribution of new stoves or retrofitting of existing stoves.

This methodology is applicable under the following conditions:

1) Project activities include distribution or retrofitting of stoves that have a thermal efficiency of at least 25 percent per the Water Boiling Test (WBT).[2]
2) Stoves are distributed to or retrofitted in households that are using inefficient baseline stoves with biomass fuels for their primary cooking needs.
3) Where a project applies Asset Accounting Option 1, this methodology is used in conjunction with an approved GHG emission reduction program and methodology.

[2] *Water Boiling Test Protocol Version 4.2.3.* Available at: https://cleancooking.org/binary-data/DOCUMENT/file/000/000/399-1.pdf

5 PROJECT BOUNDARY

The project boundary is the physical, geographical site of the improved cookstoves that utilize firewood and other biomass.

The entities impacted by project activities and that are included in the project boundary are shown in Table 2.

Table 2: Impacts and Entities Included in the Project Boundary

Impact	Entity	Primary or Secondary Impact	Intended or Unintended	Required or Optional	Justification
Time Savings	Individuals participating in fuel collection and cooking activities	Primary	Intended	Required	The primary impact related to quantification of the asset
Good Health and Well-Being[3]	All members of households receiving ICS	Secondary	Unintended	Optional	May be included as a representation of improved air quality as a result of the use of ICS
Gender Equality[3]	Woman and girls of households receiving ICS	Secondary	Unintended	Optional	May be included as a representation of increased gender equality as a result of the use of ICS
Affordable and Clean Energy[3]	Village community receiving ICS	Secondary	Unintended	Optional	May be included as a representation of increased access to affordable and clean energy as a result of the use of ICS

[3] The Sustainable Development Goals that the project activity likely contributes to include SDG 3 Good Health and Well-Being, SDG 5 Gender Equality, and SDG 7 Affordable and Clean Energy. Measured contribution to these SDGs falls outside the scope of this methodology, but projects using the methodology may make claims about contributing to these SDGs if measured and monitored.

6 BASELINE SCENARIO

In the absence of the project activity, households may:

1) Continue the use of inefficient baseline stoves;
2) Transition to a biomass-fuelled improved cookstove; or
3) Transition to use of liquefied petroleum gas (LPG) for cooking.

The price of improved cooking technology is often a prohibitive factor and a primary reason for its non-adoption. LPG availability and technology access are often limited in developing and least developed countries, especially in rural areas.[4] Therefore, these options are typically not accessible.

As of 2022, 2.4 billion people globally lack access to clean cooking technologies. In Asia, where around 60 percent of the global population lives, 1.7 billion people lack access to clean cooking technologies. Only 17 percent of the population of sub-Saharan Africa has access to clean cooking technologies, with the vast majority of the 890 million people relying on gathering biomass for cooking.[5] Therefore, continued use of inefficient baseline stoves is the most plausible baseline scenario.

The baseline scenario is the household's continued use of inefficient baseline stoves.

7 ADDITIONALITY

Table 3: Offsetting Optionality

Offsetting	
Assets generated under this methodology may not be used for offsetting.	

[4] Vigolo, V., Sallaku, R., & Testa, F. (2018). Drivers and barriers to clean cooking: A systematic literature review from a consumer behavior perspective. *Sustainability*, *10*(11), 4322. https://doi.org/10.3390/su10114322

[5] International Energy Agency (2018). *World Energy Outlook-2018*. OECD/IEA. Available at: https://www.iea.org/reports/world-energy-outlook-2018

8 QUANTIFICATION OF SUSTAINABLE DEVELOPMENT IMPACTS

8.1 Baseline Impacts

The baseline impacts are calculated by determining the average time spent per household per year on fuel collection and cooking activity in the baseline scenario.

Baseline impacts are calculated as follows:

$$T_{BL} = t_{fuel,BL} + t_{cooking,BL} \quad (1)$$

Where:

T_{BL}	Average hours per year in the baseline scenario spent on fuel collection and cooking activity per household (hours per year per household)
$t_{fuel,BL}$	Average hours per year in the baseline scenario spent on fuel collection per household (hours per year per household)
$t_{cooking,BL}$	Average hours per year in the baseline scenario spent on cooking activity per household (hours per year per household)

8.2 Project Impacts

The project impacts are calculated by determining the average time spent per household per year on fuel collection and cooking activity in the project scenario.

Project impacts are calculated as follows:

$$T_{PJ} = t_{fuel,PJ} + t_{cooking,PJ} \quad (2)$$

Where:

T_{PJ}	Average hours per year in the project scenario spent on fuel collection and cooking activity per household (hours per year per household)

$t_{fuel,PJ}$ Average hours per year in the project scenario spent on fuel collection per household (hours per year per household)

$t_{cooking,PJ}$ Average hours per year in the project scenario spent on cooking activity per household (hours per year per household)

8.3 Net Sustainable Development Impacts

The net impacts are calculated by determining the average time savings per household and multiplying that by the number of households using the ICS. The average time savings per household is calculated as the average time spent on fuel collection and cooking activity per household per year in the baseline scenario minus the average time spent on fuel collection and cooking activity per household per year in the project scenario. Lastly, the number of hours saved is converted to years saved.

Calculating the estimated time saved per household per year (hours)

$$T_{savings} = T_{BL} - T_{PJ} \quad (3)$$

Where:

$T_{savings}$ Average hours saved per year per household due to the use of project device (hours per year per household). Defaults values, found in Section 9.1, may be applied.

T_{BL} Average hours per year in the baseline scenario spent on fuel collection and cooking activity per household (hours per year per household)

T_{PJ} Average hours per year in the project scenario spent on fuel collection and cooking activity per household (hours per year per household)

Asset Accounting Option 1

Calculating the total average estimated time saved per project activity in year *y*

$$T_{y,fc} = N_y \times T_{savings} \times {}^{1}/_{(12 \times 365)} \times \left(\frac{\eta_{new\ y,i}}{\eta_{p,i}}\right) \quad (4)$$

Where:

$T_{y,fc}$	Total estimated time saved by the project activity in year *y* (years[6])
N_y	Number of households with an operational project device during year *y*
$T_{savings}$	Average hours saved per year per household due to the use of project device (hours per year per household). Defaults values, found in Section 9.1, may be applied.
$1/(12 \times 365)$	Conversion factor for hours to years[7]
$\eta_{new\ y,i}$	Efficiency of project device of type *i* in year *y*
$\eta_{p,i}$	Efficiency of project device of type *i* at the start of project activity

Calculating the decrease in efficiency of project device *i* in year *y*

$$\eta_{new\ y,i} = \eta_{p,i} \times DF_n^{(y-1)} \times 0.94 \quad (5)$$

Where:

DF_n	Discount factor to account for efficiency loss of project device per year of operation (fraction). This value may be based on actual monitoring, or on manufacturer's declaration on expected loss in efficiency, or on publicly available literature on relevant industry standards. Alternatively, a default value of 0.99 efficiency loss per year may be applied.
0.94	Adjustment factor to account for uncertainty related to project device efficiency test

[6] The total estimated time saved must be expressed in whole years, with partial years rounded down to the nearest whole year.

[7] A day is defined as 12 hours because fuel collection and cooking activity are assumed to take place during daylight hours, for example between 7AM and 7PM.

Calculating the number of households with operational project devices in year *y*

$$N_y = N_{new} \times \left[1 - (y-1) \times HDR_{y,fc}\right] \quad (6)$$

Where:

N_y	Number of households with operational project device during year *y*
N_{new}	Number of participating households registered under the project activity. Where a project proponent opts to estimate time savings for a further five years, N_{new} for the second estimation period must be determined via survey based on the remaining participating household population with operational project devices after the first five-year estimation period.[8]
y	Project year
$HDR_{y,fc}$	Estimated annual rate of decline in participating households under the project activity in year *y*. Alternatively, the methodological default value of 0.20 may be applied. Where a project proponent opts to conduct a second crediting period using Asset Accounting Option 1, the actual rate of decline in participating households during the first crediting period must be used as $HDR_{y,fc}$ for the second crediting period. The survey to obtain the value of this parameter must be conducted after the end of the first estimation period. The survey may be a monitoring survey from the underlying carbon project.

Asset Accounting Option 2

Calculating the estimated time saved per project in year *y*

$$T_{y,expost} = N_y \times T_{savings} \times {}^{1}/_{(12 \times 365)} \times \left(\frac{\eta_{new\ y,i}}{\eta_{p,i}}\right) \quad (7)$$

Where:

$T_{y,expost}$	Total time saved by the project activity in year *y* (years[9])
N_y	Number of households with operational project device during year *y*

[8] For example, if the first estimation period is five years, the survey for N_{new} of the second estimation period should be conducted in year six of the project. The same is also applied for parameter $HDR_{y,fc}$. Only one survey of N_{new} and $HDR_{y,fc}$ is required for the second crediting period when using Asset Accounting Option 1.

[9] The total time saved must be expressed in whole years, with partial years rounded down to the nearest whole year.

$T_{savings}$	Average hours saved per year per household due to the use of project device (hours per year per household). Defaults values, found in Section 9.1, may be applied.
$1/(12 \times 365)$	Conversion factor for hours to years
$\eta_{new\ y,i}$	Efficiency of project device of type *i* in year *y*. See equation 5
$\eta_{p,i}$	Efficiency of project device of type *i* at the start of project activity

Calculating the number of households with operational project devices in year *y*

$$N_y = N_{new} \times \left(1 - HDR_{y,expost}\right) \quad (8)$$

Where:

N_y	Number of households with operational project device during year *y*
N_{new}	Number of participating households registered under the project activity
$HDR_{y,expost}$	Annual rate of decline in participating households monitored under the project activity in year *y*

9 MONITORING

9.1 Data and Parameters Available at Validation

Data/Parameter	$t_{fuel,BL}$
Data unit	Hours/household
Description	Average number of hours per year in the baseline scenario spent on fuel collection per household
Equations	(1)
Source of data	Historical data or sample survey of end user
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Based on historical data or determined through sample survey of representative households. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision. To be measured before the start of project activity
Purpose of data	Calculation of baseline impacts
Comments	Not applicable if default value of $T_{savings}$ is used. The value $t_{fuel,BL}$ may be derived from historical data. Paragraph 23 of the CDM's *General guidelines for SSC CDM methodologies, v. 23*[10] provides guidance on the use of data, including historical data, to derive parameter values. Values used in other schemes (e.g., registered projects in other schemes with same type of project device) from the same region are acceptable where they are demonstrated to be suitable for use as per the procedures indicated in the *General guidelines for SSC CDM methodologies, v. 23*.

[10] Available at: https://cdm.unfccc.int/Reference/catalogue/document?doc_id=000004465

Data/Parameter	$t_{cooking,BL}$
Data unit	Hours/household
Description	Average number of hours per year in the baseline scenario spent on cooking activity per household
Equations	(1)
Source of data	Historical data or sample survey of end user
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	Based on historical data or determined through sample survey of representative households. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision. To be measured before the start of project activity
Purpose of data	Calculation of baseline impacts
Comments	Not applicable if default value of $T_{savings}$ is used. The value $t_{cooking,BL}$ may be derived from historical data. Paragraph 23 of the CDM's *General guidelines for SSC CDM methodologies, v. 23*[11] provides guidance on the use of data, including historical data, to derive parameter values. Values used in other schemes (e.g., registered projects in other schemes with same type of project device) from the same region are acceptable where they are demonstrated to be suitable for use as per the procedures indicated in the *General guidelines for SSC CDM methodologies, v. 23*.

Data/Parameter	$T_{savings}$
Data unit	Hours/household
Description	Average number of hours saved per year per household due to the use of project device

[11] Available at: https://cdm.unfccc.int/Reference/catalogue/document?doc_id=000004465

Equations	(3), (4), and (7)
Source of data	Default value or calculated using Equation (3)
Value applied	Methodological defaults: 1) 182.5 hours for urban and peri-urban areas with open-fire baseline or equivalent efficiency globally[12] [13] 2) 365 hours for rural areas with open-fire baseline or cookstoves with equivalent efficiency in sub-Saharan African countries[14] 3) 182.5 hours for rural areas with open-fire baseline or equivalent efficiency outside sub-Saharan Africa[15]
Justification of choice of data or description of measurement methods and procedures applied	Determine the annual hours saved per household using one of the following options: a) Option A: Apply methodological default value for $T_{savings}$ b) Option B: Determine a measured value of $T_{savings}$ using the sample surveys for $t_{fuel,BL}$, $t_{cooking,BL}$, $t_{fuel,PJ}$ and $t_{cooking,PJ}$. The option selected must be declared at validation.
Purpose of data	Calculation of project impacts
Comments	This parameter is set at validation only for projects that choose Option A. For projects that use Option B, the parameter is calculated ex-post.

[12] Krishnapriya, P. P., Chandrasekaran, M., Jeuland, M., & Pattanayak, S. K. (2021). "Do improved cookstoves save time and improve gender outcomes? Evidence from six developing countries". Energy Economics, 102, 105456. https://doi.org/10.1016/j.eneco.2021.105456

[13] Newcombe, K., Biondi, C. & Boatman, M (2020a). *Rapid Appraisal of Consumer Acceptance of the Jet-Flame Rocket Insert Technology in Lilongwe, Malawi*. C-Quest Capital. A default factor of half an hour saved per day is judged to be conservative: 0.5 hours × 365 days = 182.5 hours per year. A discount factor of 50 percent for urban and peri-urban areas against time savings recorded in rural areas from use of ICS is appropriate on the basis that some wood is purchased and overall fuelwood consumption is lower in urban and peri-urban households.

[14] Newcombe, K., Biondi, C. & Boatman, M (2020b). *User Assessment of Mimi Moto Stoves and Pellet Fuels. Lilongwe, Malawi.* C-Quest Capital. Byers, T. E. & Kachuma, O. (2013) *Sustainable Rural Enterprise and Livelihoods Project Impact Assessment Study Surelives Results Highlights, 2001–2012*. Malawi. This value is established from recent rigorous assessments indicating savings of two hours or more with use of ICS. The proposed conservative default factor is one hour saved per day for ICS use in rural areas, where 1.0 hours × 365 days = 365 hours per year. Referenced studies are cited under References.

[15] Krishnapriya, et al. "Do improved cookstoves save time and improve gender outcomes?"

Data/Parameter	$HDR_{y,fc}$
Data unit	Fraction
Description	Estimated annual rate of decline in participating households under the project activity in year *y*
Equations	(6)
Source of data	Default value or survey
Value applied	Default value = 0.20
Justification of choice of data or description of measurement methods and procedures applied	Use one of the following options: 1) Option A: Apply the methodological default value of 0.20 2) Option B: Based on historical data or a sample survey conducted as per the latest version of the CDM's *Guidelines for sampling and surveys for CDM project activities and programme of activities*[16] The option selected must be declared at validation. When Asset Accounting Option 1 is utilized for the first five-year crediting period, the actual rate of decline in participating households determined during the first crediting period must be used as $HDR_{y,fc}$ for the second crediting period. The survey used may be a monitoring survey from the underlying carbon project. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision.
Purpose of data	Calculation of project impacts
Comments	For Option A: A 14.9 percent stove loss rate was determined from a clustered random sampling survey across several vintages designed and conducted by Berkeley Air in Zambia.[17] Sampling was designed to achieve a 90/10 precision level and obtained 8 percent precision (lower and more accurate than 10 percent). A default value of 0.20 is a conservative adjustment. A default value of 0.20 limits stoves with a lifespan of greater than five years to individual crediting periods of no more than five years.

[16] Available at: https://cdm.unfccc.int/Reference/Guidclarif/index.html

[17] Berkeley Air Monitoring Group (2017). *Zambia Stove Survey and Water Boiling Test*. C-Quest Capital.

	For Option B: Paragraph 23 of the CDM's *General guidelines for SSC CDM methodologies, v. 23*[18] provides guidance on the use of data, including historical data, to derive parameter values. Values used in other schemes (e.g., registered projects in other schemes with the same type of project device) from the same region are acceptable when they are demonstrated to be suitable for use as per the procedures indicated in the *General guidelines for SSC CDM methodologies, v. 23*.

Data/Parameter	$\eta_{p,i}$
Data unit	Fraction
Description	Efficiency of the project device for cookstove type *i* at the start of project activity
Equations	(4), (5), and (7)
Source of data	Manufacturer specification
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	This parameter must be determined ex-ante.
Purpose of data	To determine the applicability of the project
Comments	

[18] Available at: https://cdm.unfccc.int/Reference/catalogue/document?doc_id=000004465

9.2 Data and Parameters Monitored

Data/Parameter	$t_{fuel,PJ}$
Data unit	Hours/household
Description	Average number of hours per year in the project scenario spent on fuel collection per household
Equations	(2)
Source of data	Sample survey of end user
Description of measurement methods and procedures to be applied	Determined in the first year of introduction of the devices (e.g., during the first year of the crediting period, *y* = 1) through sample survey of representative households. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision.
Frequency of monitoring/recording	First year of crediting period
QA/QC procedures to be applied	The reliability calculation[19] must be conducted to ensure that the result obtained from the survey meets the precision required.
Purpose of data	Calculation of project impacts
Calculation method	
Comments	Not applicable if default value of $T_{savings}$ is used. The sample households chosen under the baseline survey may be selected again in the sample survey for this parameter.

[19] Examples of reliability calculations are provided in "*Guidelines for sampling and surveys for CDM project activities and programmes of activities*" https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

Data/Parameter	$t_{cooking,PJ}$
Data unit	Hours/household
Description	Average number of hours per year in the project scenario spent on cooking activity (does not include food preparation) per household
Equations	(2)
Source of data	Sample survey of end user
Description of measurement methods and procedures to be applied	Determined in the first year of introduction of the devices (e.g., during the first year of the crediting period, *y* = 1) through sample survey of representative households. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision.
Frequency of monitoring/recording	First year of crediting period
QA/QC procedures to be applied	The reliability calculation must be conducted to ensure that the result obtained from the survey meets the precision required.
Purpose of data	Calculation of project impacts
Calculation method	
Comments	Not applicable if default value of $T_{savings}$ is used. The sample households chosen under the baseline survey may be selected again in the sample survey for this parameter.

Data/Parameter	$T_{savings}$
Data unit	Hours/household
Description	Average number of hours saved per year per household due to the use of project device
Equations	(3), (4), and (7)

Source of data	Default value or calculated using Equation (3)
Value applied	Methodological defaults: 1) 182.5 hours for urban and peri-urban areas with open-fire baseline or equivalent efficiency globally[20] 2) 365 hours for rural areas with open-fire baseline or cookstoves with equivalent efficiency in sub-Saharan African countries[21] 3) 182.5 hours for rural areas with open-fire baseline or equivalent efficiency outside sub-Saharan Africa[22]
Justification of choice of data or description of measurement methods and procedures applied	Determine the annual hours saved per household using one of the following options: a) Option A: Apply the methodological default value for $T_{savings}$ b) Option B: Determine a measured value of $T_{savings}$ using the sample surveys for $t_{fuel,BL}$, $t_{cooking,BL}$, $t_{fuel,PJ}$ and $t_{cooking,PJ}$. The option selected must be declared at validation.
Purpose of data	Calculation of project impacts
Comments	This parameter is calculated ex-post only for projects that choose Option B. For projects that use Option A, the parameter is set at validation.

[20] Krishnapriya, et al. "Do improved cookstoves save time and improve gender outcomes?" A default factor of half an hour saved per day is judged to be conservative: 0.5 hours × 365 days = 182.5 hours per year. A discount factor of 50 percent for urban and peri-urban areas against time savings recorded in rural areas from use of ICS is appropriate on the basis that some wood is purchased and overall fuelwood consumption is lower in urban and peri-urban households (CQC & Civitas, 2020a, b).

[21] Newcombe, Biondi, and Boatman. *Rapid Appraisal of Consumer Acceptance of the Jet-Flame Rocket Insert Technology in Lilongwe, Malawi*. This value is established from recent rigorous assessments indicating savings of two hours or more with use of ICS. The proposed conservative default factor is one hour saved per day for ICS use in rural areas, where 1.0 hours × 365 days = 365 hours per year. Referenced studies are cited under References.

[22] Krishnapriya, et al.. "Do improved cookstoves save time and improve gender outcomes?"

Data/Parameter	$\eta_{new\ y,i}$
Data unit	Fraction
Description	Efficiency of project device for cookstove type *i* in year *y*
Equations	(4) (5) and (7)
Source of data	Calculated from Equation (5)
Description of measurement methods and procedures to be applied	Efficiency of the improved cookstoves is estimated using Equation 5.
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
QA/QC procedures to be applied	
Purpose of data	Calculation of project impacts
Calculation method	$\eta_{new\ y,i} = \eta_{p,i} \times DF_n^{(y-1)} \times 0.94$
Comments	

Data/Parameter	N_{new}
Data unit	Quantity
Description	Number of participating households registered under the project activity
Equations	(**6**) and (8)
Source of data	Internal records
Description of measurement methods and procedures to be applied	

Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
QA/QC procedures to be applied	
Purpose of data	Calculation of project impacts
Calculation method	
Comments	Where a project proponent opts to conduct a second crediting period using Asset Accounting Option 1, N_{new} must be determined via a survey based on the remaining participating household population with operational project devices after the end of the first crediting period. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision.

Data/Parameter	Lifespan
Data unit	Number of years
Description	The operating lifetime of project device
Equations	
Source of data	Manufacturer specification, or for retrofitted stoves the lifespan of stove may be determined using the CDM's *Tool to determine the remaining lifetime of equipment*.[23]
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Fixed and recorded at the commissioning of the project

[23] CDM (2009). *Methodological tool to determine the remaining lifetime of equipment*, *version 01*. Available at: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

QA/QC procedures to be applied	
Purpose of data	To determine the eligible length of crediting period
Calculation method	
Comments	Where the lifespan of project devices is less than the crediting period, it must be demonstrated that the devices will be replaced after the lifespan has ended. If it is not possible to demonstrate that the project devices will be replaced with new devices, no asset may be claimed beyond the lifespan of the project devices.

Data/Parameter	Date of commissioning of project device
Data unit	Date
Description	Date of distribution/installation of project device
Equations	
Source of data	Internal record
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Fixed and recorded at the commissioning of the project
QA/QC procedures to be applied	
Purpose of data	Determination of batch commissioning date
Calculation method	
Comments	

Data/Parameter	Date of commissioning of batch
Data unit	Date
Description	The latest date of commissioning of a device within the batch must be used as the date of commissioning for the entire batch.
Equations	
Source of data	Internal record
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Fixed and recorded at the commissioning of the last project device in the batch
QA/QC procedures to be applied	
Purpose of data	Determination of the start of monitoring and crediting for the batch
Calculation method	
Comments	The interval between the dates of commissioning of the first and last project device within the batch should be less than or equal to a full year.

Data/Parameter	$HDR_{y,expost}$
Data unit	Fraction
Description	Annual rate of decline in participating households monitored under the project activity in year y
Equations	(8)
Source of data	Sample survey of end user

Description of measurement methods and procedures to be applied	Determined through sample survey of representative households. Sample survey must be carried out based on questionnaires or interviews. Sample survey should meet 90/10 confidence precision. Alternatively, data from the monitoring surveys and monitoring reports of the underlying carbon projects may be used to derive the value of $HDR_{y,expost}$.
Frequency of monitoring/recording	At least once every two years (biennial)
QA/QC procedures to be applied	The reliability calculation must be conducted to ensure that the result obtained from the survey meets the precision required.
Purpose of data	Calculation of project impacts
Calculation method	
Comments	

9.3 Description of the Monitoring Plan

Purpose of monitoring

A monitoring survey must be conducted with participating households to obtain an unbiased and reliable estimate of how many households continue to use the ICS and to quantify time savings due to use of the project device.

The following data must be monitored and recorded via a monitoring survey.

1) **Asset Accounting Option 1:** Monitoring will be conducted on a one-time basis upon the commissioning of the project devices and must include:
    a) Number of households with operational project devices, N_y, and
    b) The time savings on fuel collection and cooking activity due to use of the project device, $T_{savings}$, unless methodological default value has been applied.
2) **Asset Accounting Option 2:** Monitoring will be conducted on an ongoing basis for the purpose of continuous monitoring of the project devices and must include:
    a) Number of households with operational project devices, N_y;

b) The time savings on fuel collection and cooking activity due to use of the project device, $T_{savings}$, unless methodological default value has been applied; and

c) Annual rate of decline in participating households monitored under the project activity in year *y*, $HDR_{y,expost}$.

Monitoring procedures, including estimation, modelling, measurement and calculation approaches

A sample survey may be used to monitor the parameters as per the relevant requirements for sampling in the CDM's *Standard for sampling and surveys for CDM project activities and programmes of activities*.[24]

The sample size estimations should follow the CDM's *Guideline for sampling and surveys for CDM project activities and programmes of activities*.[25]

The parameters may be monitored in a common survey. A random sub-sample within the common survey is allowed if the reliability specification (i.e., 90/10 confidence/precision) is achieved for each parameter.

Procedures for managing data quality

The reliability check will be performed to ensure the required confidence/precision is met for each sampled parameter. Where the reliability required is not met, the sampling may be repeated with an increased sample size. Alternatively, the upper or lower bound of 90 percent confidence interval may be chosen.

Monitoring frequency

Asset Accounting Option 1

The project must perform a monitoring survey within one year of the commissioning date of a given batch of project devices. The latest commissioning of a project device within the project must be used as the date of commissioning for the batch. Projects may not add additional devices to a batch one year after the commissioning date of the first device of the batch.

Asset Accounting Option 2

A monitoring survey must be performed in ongoing monitoring periods for the respective batch of project devices. The monitoring frequency for parameter $HDR_{y,expost}$ is at least once every two years.

[24] CDM (2019). *Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 08.0*. Available at: https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20191129115244256/Meth_stan05.pdf

[25] CDM (2015). *Guideline: Sampling and surveys for CDM project activities and programmes of activities*, *Version 04.0*. Available at: https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

9.4 Project Resilience Measures Required for Asset Accounting Option 1

The project proponent must demonstrate that sufficient measures are in place to ensure the project's continued implementation. The project proponent must explain in the project description the proposed measures to ensure the continued implementation of the project for the duration of the crediting period. At a minimum, these resiliency measures must include activities that:

1) Ensure project devices installed are operational and verify the number of participating households with operational project devices via a sample survey upon the commissioning of the last project device in the batch;
2) Ensure sufficient training is provided to ICS beneficiaries, demonstrating:
    a) How to properly use the project-specific stove,
    b) Best practices for maintaining the operability of the project stove throughout the crediting period and beyond, and
    c) How to access any service and support activities that will be undertaken;
3) Ensure post ICS installation service and maintenance support are accessible to ICS beneficiaries; and
4) Ensure sufficient provision is made for parts and servicing of project stoves for the duration of the crediting period by demonstrating either:
    a) Project proponent provides replacement parts and/or maintenance, or
    b) Project participants have access to replacement parts and/or maintenance through local businesses.

10 REFERENCES

Berkeley Air Monitoring Group (2020). *Effects on Gender-related Outcomes after the Introduction of Improved Cookstoves in Rural Zambia*. C-Quest Capital. Available at: http://www.carbonmarket-foundation.org/userfiles/zdk/file/CQC_BA_Zambia_Gender%20Impacts_vF2%20copy.pdf

Berkeley Air Monitoring Group (2018). *Impacts and Effects of Improved Wood Burning Stoves on Time Use and Quality: An Experimental Study in Rural Kenya*. Clean Cooking Alliance. Available at: https://cleancooking.org/wp-content/uploads/2021/07/560-1.pdf

Byers, T. E. & Kachuma, O. (2013). *Sustainable Rural Enterprise and Livelihoods Project Impact Assessment Study Surlives Results Highlights, 2001–2012*. Malawi.

Krishnapriya, P. P., Chandrasekaran, M., Jeuland, M., & Pattanayak, S. K. (2021). Do improved cookstoves save time and improve gender outcomes? Evidence from six developing countries. *Energy Economics*, *102*, 105456. https://doi.org/10.1016/j.eneco.2021.105456

Newcombe, K., Biondi, C. & Boatman, M (2020a). *Rapid Appraisal of Consumer Acceptance of the Jet-Flame Rocket Insert Technology in Lilongwe, Malawi*. C-Quest Capital.

Newcombe, K., Biondi, C. & Boatman, M (2020b). *User Assessment of Mimi Moto Stoves and Pellet Fuels. Lilongwe, Malawi.* C-Quest Capital.

APPENDIX 1: NON-BINDING SURVEY QUESTIONNAIRES

The questionnaires provided below serve as a basic example. It is expected that if used, these questionnaires will be modified based on local cultural, environmental, and economic characteristics to improve data accuracy.

a) Baseline survey

1.1. General information

Title of project activity	
Name of surveyor	
Date of survey	dd/mm/yyyy

1.2. Household profile

Username (household representative)	
Household size (total number of people)	
Provide age and gender of each household member below:	
Adults	
Children	
Address/GPS	
Phone number (if available)	

1.3. Baseline stove description prior to project implementation

Mark X for the type of stove used

A three-stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system	
Any other type of stove	

1.4 Fuel collection

Prior to project implementation	
What type of fuel do you use in the stove? (√ *the fuel used and fill in the relevant sections below*)	☐ Firewood ☐ Charcoal ☐ Agricultural residues ☐ Dung
a) Firewood	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	
b) Charcoal	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	

c) Agricultural residues	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	
d) Dung	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	
Total time spent on cooking fuel collection **(Sum of a, b, c and d)**	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*

1.5 Cooking activity

Prior to project implementation	
How many hours per day do you spend cooking on your existing stove?	(hours and minutes)
Which family members are responsible for the above task?	

b) **Project survey**

1.1. General information

Title of project activity	
Name of surveyor	
Date of survey	dd/mm/yyyy

1.2. Household profile

Username (household representative)	
Household size (total number of people)	
Provide age and gender of each household member below:	
Adults	
Children	
Address/GPS	
Phone number (if available)	

1.3. Identification of project cookstove and its status

Cooking device	Improved cookstove
Number of project cookstoves installed	
Project cookstove 1	
Model name	
Unique ID	
Date of installation	dd/mm/yyyy

Project cookstove 2	
Model name	
Unique ID	
Date of installation	dd/mm/yyyy
Project cookstove 3	
Model name	
Unique ID	
Date of installation	dd/mm/yyyy
Is the project cookstove in good condition and operational? (Physically check the stove.)	Yes/No
The surveyor should stop the interview with household if the project cookstove is not operational.	

1.4 Fuel collection

After project implementation	
What type of fuel do you use in the stove? (*√ the fuel used and fill in the relevant sections below*)	☐ Firewood ☐ Charcoal ☐ Agricultural residues ☐ Dung
a) Firewood	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	

b) Charcoal	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	
c) Agricultural residues	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis ☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal change.*
Which family members are responsible for the above task?	
d) Dung	
Method to acquire the fuel	☐ Collected ☐ Purchased
How frequently do you gather the fuel?	☐ Daily basis ☐ Weekly basis

	☐ Other (please specify) _____
Based on the frequency above, how many hours do you spend on gathering cooking fuel?	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*
Which family members are responsible for the above task?	
Total time spent on cooking fuel collection **(Sum of a, b, c and d)**	_____ (hours and minutes) per (day/week) (*choose one*) *Provide additional details on time spent if affected by seasonal changes.*

1.5 Cooking activity

After project implementation	
How many hours per day do you spend cooking after installation of the project cookstove?	(hours and minutes)
Which family members are responsible for the above task?	