ARTICLE 6.4 MECHANISM

A6.4-SB004-AA-A10–APPENDIX 4

Draft Methodology

Energy efficiency measures in thermal applications of non-renewable biomass

Version 01.1

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical activity(ies)	Introduction of efficient thermal energy generation units utilizing non-renewable biomass (e.g. complete replacement of existing biomass-fired cookstoves or ovens or dryers with more efficient appliances), **or retrofitting of existing units** reducing the use of non-renewable biomass for combustion
Type of GHG emissions mitigation action	Energy efficiency: Displacement or energy efficiency enhancement of existing heat generation units results in saving of non-renewable biomass and reduction of GHG emissions

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises efficiency improvements in thermal applications of non-renewable biomass. Examples of applicable technologies and measures include the introduction of high efficiency biomass fired activity devices (cookstoves or ovens or dryers) to replace the existing devices and/or energy efficiency improvements in existing biomass fired cookstoves or ovens or dryers.[1]

2.2. Applicability

[1] Implementation of Greenfield applications is not covered in this methodology.

Annex 4 to the SB03 meeting report i.e. “Information Note: Status of current work on the application of the requirements referred to in chapter V B (Methodologies) of the rules, modalities and procedure” (hereafter referred to as Requirements), captured the status of the work undertaken by the Supervisory Body related to the request of the CMA in decision 3/CMA.3, paragraph 6(d), to develop recommendations on the application of the requirements referred to in chapter V B (Methodologies) of the rules, modalities and procedures while stating it is not final, may not reflect all the views expressed and forms a basis for further work on this matter by the Supervisory Body. Elements of ‘Draft requirements’ in annex 4 are grouped and included below:

Encouraging ambition over time

12. Paragraph 33 of the RMP states that ‘Mechanism methodologies shall encourage ambition over time’.

13. This requirement shall be implemented through the application of approaches to be elaborated in accordance with further guidance and procedures to be developed by the Supervisory Body, which are relevant and applicable to the implementation of other elements of para 33 of the RMP.

14. These approaches shall include approaches based on:

(a) increasing the stringency of the baselines over time;

(b) the implementation of replicable and scalable mitigation activities.

15. Developing Baseline Contraction Factors (BCFs) to periodically adjust the baseline downwards, is one way of implementing more stringent baselines over time. BCFs could be developed by the Supervisory Body at the request of the host Party or could be developed by host Party and approved by the Supervisory Body. A procedure [will][could] be established to guide the development of BCFs including the process for consultation with the host Parties.

16. Approaches to include progressively more efficient and less GHG intensive technologies in programmes, or activities which expand the user base of project technologies or greater penetration among potential end users, or expansion of geographical sectoral coverage, are potential ways of supporting replicability and scalability of mitigation activities.

17. The Supervisory Body shall develop further guidance on the applicability and/or procedures on the implementation of these approaches.

Contribution to equitable sharing of mitigation benefits

34. Paragraph 33 of the RMP states that the ‘Mechanism methodologies shall contribute to the equitable sharing of mitigation benefits between the participating Parties’.

35. Mechanism methodologies may specify application of [an approach based on increasing the stringency of the baselines over time under paragraph 14 (a)] [approaches identified under paragraphs 14 to 17] so as to ensure that activity will contribute to equitable sharing of mitigation benefits.

36. Mechanism methodologies shall require the activity participants to describe the measures taken to contribute to the delivery of mitigation benefits to the participating Parties in the project design documents.

37. This requirement may also be operationalized through the DNAs, acknowledging that it is their full right to demand an equitable share of benefits as a pre-condition for the approval of activity(ies) and/or authorization of A6.4ERs to achieve their NDCs. Activity participants shall follow any guidance from the DNAs in this regard.

Alignment with the long-term temperature goals of the Paris Agreement

41. Paragraph 33 of the RMP states that ‘Mechanism methodologies shall align with the long-term temperature goal of the Paris Agreement.’

> *42. Mechanism methodologies shall require demonstration that the activity is aligned with long-term temperature goals of the Paris Agreement.*
>
> *43. Mechanism methodologies may require the application of 'approaches' identified under paragraph 14 to 17 so as to ensure that activity aligns with the long-term temperature goal of the Paris Agreement.*
>
> *44. The Supervisory Body will develop further guidance on how this requirement will be demonstrated.*

3. Application of this methodology shall:

   (a) Encourage ambition over time;

   (b) Contribute to the equitable sharing of mitigation benefits between the participating Parties; and

   (c) Require that activity aligns with the long-term temperature goal of the Paris Agreement.

4. The requirements in paragraph 3 shall be met using approaches based on:

   (a) Increasing the stringency of the baselines over time;

   (b) Implementation of replicable and scalable mitigation activities.

5. With regard to 4 (b) above, implementation of replicable and scalable mitigation activities should be demonstrated by referring to:

   (a) Plans for progressive deployment of more efficient and less GHG intensive technologies in programmes or activities; or

   (b) Activities that expand the user base of activity technologies or increase penetration of the activity technologies among potential end users over time; or

   (c) The expansion of geographical sectoral coverage.

6. An option to apply Baseline Contraction Factors (BCFs) to periodically adjust the baseline downwards to implement more stringent baselines over time is included in this methodology.[2] If the host Party has provided BCFs, those BCFs shall be applied when choosing this option. If the host Party has not provided BCFs and the Supervisory Body has published applicable BCFs or interim BCFs, the BCFs published by the Supervisory Body shall be applied by the activity participant when using this option.

7. The activity participants shall describe in the activity design document the measures taken to contribute to the delivery of mitigation benefits to the participating Parties. In this regard, the activity Participant shall follow any guidance from the designated national authorities (DNAs) of the host Part(ies).

[2] Activity participants may propose alternative approaches for the consideration of the Supervisory Body.

Rationale for changes

There was support at SB03 for grouping elements of RMP requirements when providing options for meeting those requirements; although, details of the groupings was not given. Paragraph 3 above lists three such requirements from the RMP and paragraph 4 provides two broad options to meet those requirements. Paragraph 5 details the options for showing replicable and scalable activities. Paragraph 6 elaborates the process for increasing baseline stringency over time.

Irrespective of the provisions in paragraphs 4–6, the baseline approaches under this methodology result in more conservative estimation of emission reductions as compared to methods now prevalent (e.g. under the Clean Development Mechanism). They include conservative default values for wood-to-charcoal conversion factor, average annual consumption of woody biomass per person, fraction of non-renewable biomass, efficiency of pre-project device consistent with the baseline requirements from the RMP.

Draft Requirements

Being real, transparent, conservative, credible

20. Paragraph 33 of the RMP states that the 'Mechanism methodologies shall be real, transparent, conservative, credible'.

21. Mechanism methodologies shall ensure that the results of Article 6.4 activities developed using them, represent actual tonnes of greenhouse gas emissions reduced or removed and shall provide credible methods for estimating emission reductions. Such estimation should be based on up-to-date scientific information and reliable data gathered through robust monitoring methods, excluding extraneous cofactors affecting emission reductions.

22. Mechanism methodologies shall require transparent descriptions of the source of the data used, and disclosure of data sources unless they are confidential, the assumptions made, the references used and the underlying steps deriving the estimates of the results of Article 6.4 activities, where necessary, including equations.

23. Mechanism methodologies shall result in conservative emission reduction estimates, from the measures applied or the options chosen, or assumptions made and shall not overestimate the emission reductions from Article 6.4 activities. Where relevant, the mechanism methodologies shall require the accounting of uncertainty associated with modelled and surveyed data.

8. The emission reductions achieved using this methodology shall be real, transparent, conservative and credible, representing actual tonnes of GHG emissions reduced. This requirement shall be met by:

(a) Basing the estimation of emission reductions on up-to-date scientific information that is clearly and consistently referenced using a standard citation method;

(b) Including transparent descriptions of the source of the data used and the assumptions made;

(c) Including all the underlying steps followed in deriving the estimates of the results, where necessary including equations; and

(d) Ensuring emission reductions are not overestimated, for instance, where applicable, by requiring the accounting of uncertainty associated with modelled and surveyed data.

Rationale for changes

The above paragraphs are self explanatory.

Draft Requirements

Aligning with NDC of each participating Party, if applicable and LT-LEDs, if it has submitted one [and the long-tern goals of the Paris Agreement]

38. Paragraph 33 of the RMP states that 'mechanism methodologies shall, in respect of each participating Party, contribute to reducing emission levels in the host Party, and align with its NDC, if applicable, its long-term low GHG emission development strategy, if it has submitted one and the long-term goals of the Paris Agreement'

39. Mechanism methodologies shall require demonstration that the activity aligns with the latest NDC of the host Party (if applicable) or [encourages] [enables] increasing ambition in the NDCs, and aligns with the LT-LEDs (if it has submitted one) [and the long-term goals of the Paris Agreement].

40. The Supervisory Body will develop further guidance on how this requirement will be demonstrated.

9. Activity participants shall demonstrate to each participating Party that the activity contributes to reducing emission levels in the host Party, and aligns with the host Party's NDC, the host Party's long-term low GHG emission development strategy, if it has submitted one and the long-term goals of the Paris Agreement. In this regard, the host Party's communications, including in relation to participation requirements under the Article 6.4 Mechanism, may be referenced.

Rationale for changes

The above changes are self explanatory.

10. In the case of cookstoves, the methodology is applicable to the introduction of single pot or multi pot portable or in-situ cookstoves with rated thermal efficiency of at least ~~25~~ 30 per cent. Data / Parameter table 14 details the testing and certification requirements in this regard.

Rationale for changes

According to ISO/TR 19867-3:2018 "*Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 3: Voluntary performance targets for cookstoves based on laboratory testing*", tiered performance targets provide a set of reference values against which to monitor and assess progress on five criteria: efficiency, emissions of fine particulate matter (PM2.5), emissions of carbon monoxide, safety and durability. The tiers range from the lowest level, Tier 0, representing the performance typical of open fires and the simplest types of solid-fuel cookstoves, to the highest level, Tier 5, which represents high levels of performance sought for each of these five characteristics. Distributed between these lower and upper levels are tiers representing intermediate goals that can be used to assess progress along a continuum of performance. Several countries have adopted the ISO standard with due modifications to suit the national circumstances. Therefore, the methodology includes options to use the ISO testing method or apply a comparable national standard. These tests assign a tier or ranking for the performance separately for the five parameters of thermal efficiency, CO emission, particulate emission, safety and durability. The methodology includes a mandatory minimum thermal efficiency. The information required on the other parameters allows for evaluation of the performance for health and other attributes, but no minimum threshold is included for those parameters as they are usually covered under national requirements.

Table: Overview of tiers of performance under ISO/TR 19867-3:2018

	Tier[b]	Thermal efficiency %	Emissions		Safety (score)[c]	Durability (score)[d]
			CO g/MJ$_d$	$PM_{2,5}$ mg/MJ$_d$		
Better performance	5	≥50	≤3,0	≤5	≥95	<10
	4	≥40	≤4,4	≤62	≥86	<15
	3	≥30	≤7,2	≤218	≥77	<20
	2	≥20	≤11,5	≤481	≥68	<25
	1	≥10	≤18,3	≤1030	≥60	<35
	0	<10	>18,3	>1030	<60	>35

11. [~~The aggregate energy savings of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input~~.]

12. The activity design document shall demonstrate that non-renewable biomass has been used in the activity region since 31 December 1989, using survey methods or by referring to published literature, or official reports or statistics.

13. [~~For cases where the biomass is sourced from renewable sources, the activity participants should use a corresponding Type I methodology~~.]

14. The activity design document shall explain the proposed method for distribution of activity devices including the method to avoid double counting of A6.4ERs such as unique identifications of product and end-user locations (e.g. programme logo).

15. The actvity design document shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that activity stove manufacturers, wholesale providers or others claim credit for emission reductions from the activity devices.

3. Definitions

16. The following definition shall also apply:

(a) **Batch** - is defined as the population of the device of the same type commissioned during a certain period of time (e.g. week or month) in a certain calendar year. To establish the date of commissioning, the Activity Participant may opt to group the devices in “batches” and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch.[3]

4. Baseline methodology

4.1. Activity boundary

17. The activity boundary is the physical, geographical site of the efficient devices that utilize biomass.

4.2. Additionality

[3] If the efficiency drop of activity devices is monitored through the first batch approach (see paragraph 44 below), activity participants shall describe in the activity design document the measures taken to ensure that all batches receive the same level of quality control in the production, and maintenance/replacements during the crediting period, as the first batch. Monitoring reports shall describe the number of actions taken for maintenance and replacements to all batches separately.

Draft Requirements

60. Paragraph 38 of the RMP states that 'Each mechanism methodology shall specify the approach to demonstrating the additionality of the activity. Additionality shall be demonstrated using a robust assessment that shows the activity would not have occurred in the absence of the incentives from the mechanism, taking into account all relevant national policies, including legislation, and representing mitigation that exceeds any mitigation that is required by law or regulation, and taking a conservative approach that avoids locking in levels of emissions, technologies or carbon-intensive practices incompatible with paragraph 33 above'.

61. Paragraph 39 of the RMP states that 'The Supervisory Body may apply simplified approaches for demonstration of additionality for any least developed country or small island developing State at the request of that Party, in accordance with requirements developed by the Supervisory Body'.

62. Additionality assessment shall require that the activity participants take a conservative approach that avoids locking in levels of emissions, technologies or carbon-intensive practices incompatible with the requirements discussed under sections 2.3 to 2.11 above.

63. Mechanisms methodology shall require that additionality demonstration of the article 6.4 activity is established by showing that:

(a) Without the incentive from the mechanism, the activity would not be feasible; and

(b) The activity represents mitigation that exceeds any mitigation that is required by law or regulation.

64. The Supervisory Body may approve a list of technologies that are considered additional and termed as positive list of technologies. Mechanism methodologies should require that the activity participant demonstrate that that the proposed article 6.4 activity is part of the positive list of technologies established by the Supervisory Body in order to use the positive list for the demonstration of additionality.

65. The Supervisory Body will consider the technologies for which necessary conditions exist with a high degree of certainty in accordance with the requirements in paragraph 63, where relevant on a regional basis, considering special circumstances of LDCs/SIDS, as the basis for developing the positive list.

66. The Supervisory Body will develop further guidance on the demonstration of additionality and the positive list of technologies at a future meeting of the Supervisory Body, including simplified approaches for demonstration of additionality for any LDCs/SIDS.

18. Additionality of the activity shall be demonstrated using a robust assessment that shows the activity would not have occurred in the absence of the incentives from the mechanism, taking into account all relevant national policies, including legislation, and representing mitigation that exceeds any mitigation that is required by law or regulation.

19. The activity participants are required to take a conservative approach that avoids locking in levels of emissions, technologies or carbon-intensive practices incompatible with the requirements described in paragraphs 38–39 of the RMP.

20. If the Supervisory Body has established a positive list of technologies for additionality, the activity participant should demonstrate that the proposed activity is part of that positive list and use that option to demonstrate additionality.

21. [Performance standard: Projects with cookstoves that demonstrate top-tier performance (e.g. Tier 5 and 4 under ISO/TR 19867-3:2018) for all five parameters, i.e. efficiency, emissions of fine particulate matter (PM2.5), emissions of carbon monoxide, safety and

durability in accordance with ISO/TR 19867-3:2018 or a comparable national standard, are considered automatically additional. The Supervisory Body may reassess the validity of the provision and update it if needed.]

22. [Practice based method: Activity participants shall demonstrate ex ante that the penetration of the activity technology is equal to or less than 2.5 per cent of the technologies providing similar services to end-users based on the annual sales of units, or 1.5 per cent based on the stock of units, in the applicable geographic area in order to be considered as automatically additional. The applicable geographical area to determine the penetration should be the entire host country. If the activity participants opt to limit the applicable geographical area to a specific geographical area (such as province, region, etc.) within the host country, then they shall provide justification on the essential distinction between the identified specific geographical area and rest of the host country.

23. The market penetration shall be determined using one of the following options:

(a) Official statistics or reports, relevant industry association reports or peer-reviewed literature;

(b) Results of a sampling survey conducted by activity participants or a third party as per the latest version of “Standard: Sampling and surveys for Article 6.4 activities and programme of activities” covering technologies/measures providing similar services as the activity technology/measure.

24. If the market penetration is determined using the data based on the annual sales of units, the most recent three years’ data available at the time of submission of the activity design document for validation shall be used. This period is considered necessary to capture variations of the sales data from year to year. Exceptionally, historical sales data covering less than three years, but a minimum of one year may be used with due justifications (e.g. demonstrated unavailability of data despite the efforts made).

25. To determine the market penetration using the data based on the stock of units, the most recent data available at the time of submission of the activity design document or CPA-DD for validation/inclusion shall be used, and the data vintage used shall not include data older than three years prior to: (a) the start date of the activity; or (b) the start of validation/inclusion, whichever is earlier].

Rationale for changes

The mechanism methodologies should require that the activity participant demonstrates that the proposed article 6.4 activity is part of the positive list, if such as list of technologies has been established by the Supervisory Body. The technologies may qualify to be on the positive list for which necessary conditions exist with a high degree of certainty, where relevant on a regional basis, considering special circumstances of LDCs/SIDS.

ISO/TR 19867-3:2018 standard, which is a performance based standard, captures the attributes of a stove for thermal efficiency but also for CO and particulate emissions, safety and durability. Many studies have pointed out that stoves distributed under the CDM, Gold standard, Verra and other schemes may have addressed thermal efficiency but have not performed well with respect to indoor air pollution and consequently have had little impact on reducing adverse impact on the health of women and children. Currently there is virtually no biomass stove design/product that meets higher tiers (i.e. 4 and 5) for all the parameters of the ISO standard cited above that are available commercially. Therefore, assigning automatic additionality could be considered for higher tier stoves in the ISO standard or corresponding national standard.

A practice based method relying on market penetration can be considered as a means to check additionality. Work under the CDM in the area could be a useful reference. As a threshold for automatic additionality, based on the findings from Rogers' 1962 diffusion model, that a technology is considered to be in the innovation stage until reaching the 2.5 per cent diffusion level[4] was included in the recent revision of related tools and methodologies under the CDM.[5] A 2.5 per cent threshold for sales data (three years' sales average) and a 1.5 per cent threshold for stock data have been specified under the CDM, considering that sales data, when available, are more reliable than the stock data. In the case of stock, the denominator is total number of existing technologies/products over the lifetime of the technologies/products, whereas the numerator represents new technologies/products for a much shorter duration (since the introduction of newer technologies/products). The use of sales data is preferable, and stock data should be used only if there is no sales data. However, the penetration data may be more difficult to gather and verify, especially for recent vintages.

4.3. Emission reductions

[4] See annex 9 to the MP 83 meeting report regarding Roger's theory of diffusion available at https://cdm.unfccc.int/Panels/meth/index.html.

[5] Refer to meeting report of EB115 and associated annexes related to methodological standards available at https://cdm.unfccc.int/EB/index.html.

Draft Requirements

Being below business as usual

24. Paragraph 33 of the RMP states that the ‘Mechanism methodologies shall be below ‘business as usual’’.

25. Mechanism methodologies shall require that the baseline selected following the approach described under section 2.15 shall be demonstrated as being below business-as-usual (BAU). For that purpose, the mechanism methodology shall require the identification of the BAU scenario(s) and provide an approach for the calculation of BAU emissions.

Recognizing suppressed demand

30. Paragraph 33 of the RMP states that the ‘Mechanism methodologies shall recognize suppressed demand’.

31. Supervisory Body will recognise suppressed demand, where applicable, by considering that the baseline scenario is not the historical condition, but rather a situation where the baseline equipment or measure cannot realistically provide the level of service required of the Article 6.4 activity and alternative technology that provides the level of service comparable to Article 6.4 activity is assumed/assessed.

32. In context where the baseline equipment or measure cannot realistically provide the level of service of the Article 6.4 activity, the Supervisory Body will recognize alternative technology that provides the level of service comparable to Article 6.4 activity to be the baseline scenario rather than a historical situation.

33. The Supervisory Body will assess if suppressed demand is a plausible situation for a given context on a case-by-case basis and, where relevant, it will recognize suppressed demand by including benchmarks and default factors in specific methodologies that may not be below BAU. Mechanism methodologies may include such factors where relevant for use by activity participant, however activity participants shall not directly estimate supressed demand while applying a methodology.

Baseline setting

54. Paragraph 36 of the RMP states that

‘Each mechanism methodology shall require the application of one of the approach(es) below to setting the baseline, while taking into account any guidance by the Supervisory Body, and with justification for the appropriateness of the choices, including information on how the proposed baseline approach is consistent with paragraphs 33 and 35 above and recognizing that a host Party may determine a more ambitious level at its discretion:

A performance-based approach, taking into account:

(i) Best available technologies that represent an economically feasible and environmentally sound course of action, where appropriate;

(ii) An ambitious benchmark approach where the baseline is set at least at the average emission level of the best performing comparable activities providing similar outputs and services in a defined scope in similar social, economic, environmental and technological circumstances;

(iii) An approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 above’.

55. Paragraph 27 of RMP states that ‘A host Party may specify to the Supervisory Body, prior to participating in the mechanism: (a) Baseline approaches and other methodological requirements.

> *56. Mechanism methodologies shall justify the appropriateness of the choice(s) made in the methodology for setting the baseline while taking into account guidance on the performance-based approach in the RMP. For the approach based on existing actual or historical emissions, the mechanism methodology may apply [approaches identified under paragraph 14 to 17 as an option] [BCF(s) identified under paragraph 15 as one option] to adjust the existing actual or historical emissions downwards to ensure alignment with paragraph 33 of the RMP.*
>
> *57. Mechanism methodology should include provisions to progressively increase the stringency of the baselines applied in the methodology, as applicable.*
>
> *58. A host Party may determine a more ambitious baseline requirement at its discretion.*
>
> *59. The Supervisory Body may undertake further assessment and develop further guidance in relation to the baselines at a future meeting of the Supervisory Body.*

26. This methodology requires the identification of the BAU scenario(s) and activity participants shall provide an approach for the calculation of BAU emissions. For that purpose, activity participants may consider the existing actual or historical values for the following parameters that are the key determinants of emissions under the methodology:

    (a) Wood-to-charcoal conversion factor, where applicable;

    (b) Average annual consumption of woody biomass per person; and

    (c) Efficiency of pre-activity device.

27. This methodology requires that the activity participant identify below business-as-usual (BAU) scenario(s) from one of the baseline scenarios described in paragraph 29 below and provide an approach for the calculation of BAU emissions and achieve emission reductions that are below BAU.

28. The methodology recognizes a suppressed demand scenario (i.e. minimum service level provided by the activity technology is not met in the baseline scenario).

> **Rationale for changes**
>
> The above paragraph is self-explanatory.

29. This methodology requires use of a performance-based approach to identify the baseline scenario unless the host Party has determined a more ambitious baseline level, which would take precedence. The baseline scenario shall be determined using:

    (a) Best available technologies that represent an economically feasible and environmentally sound course of action, where appropriate;

    (b) An ambitious benchmark approach where the baseline is set at least at the average emission level of the best-performing, comparable activities providing similar outputs and services in a defined scope in similar social, economic, environmental and technological circumstances;

    (c) An approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 of requirements referred to in chapter V.B (Methodologies) of the rules, modalities and procedures (RMP) of the Article 6.4 Mechanism.

Rationale for changes

Under this methodology, baseline emissions are the function of several parameters, including wood-to-charcoal conversion factor where applicable, average annual consumption of woody biomass per person or per device, fraction of non-renewable biomass, and efficiency of pre-project device. They are key determinants of the baseline emissions estimates and where default values are applicable they are conservatively determined, taking into account the baseline approaches as described in the table below. The table below shows the default values included in the exising CDM methodology and those proposed in this document for the Article 6.4 Mechanism and explains how more rigourous approaches have been introduced as per the RMP.

Table 1: Default values included in the exising CDM methodology and those proposed for the Article 6.4 Mechanism

Key parameters	Default values included in the existing CDM methodology	Default values proposed in this document for Article 6.4 Mechanism	Corresponding baseline approach(es) chosen to determine the conservative default value
Wood-to-charcoal conversion factor (See paragraph 42 and Data/Paramater table 10)	6	4	The new default value was conservatively determined following approaches in both paragraph 29(a) and paragraph 29(b)
Average annual consumption of woody biomass per person (See paragraph 41 and Data/Paramater table 2)	0.5 tonnes/person/year	0.4 tonnes/person/year	The new default value was conservatively determined following approaches in paragraph 29(b)
Fraction of non-renewable biomass (See paragraph 31 and Data/Paramater table 6 and 17)		0.3 (0.6 as a cap)	N/A
Efficiency of pre-project device (See paragraph 36 and 39 and Data/Paramater table 9)	a) 0.10 for a three-stone fire, b) 0.20 for other types	a) 0.15 for a three-stone fire, b) 0.25 for other types	The new default value was conservatively determined following approaches in paragraph 29(a)

The impacts of the conservative default values on emission reductions are described in the table below the “Data / Parameter table 23" (page 46).

30. [It is assumed that in the absence of the activity, the baseline scenario would be the projected use of fossil fuels to meet similar thermal energy needs as those provided by the activity devices.]

> The above requirement and corresponding emission factors of fossil fuels projected to be used to substitute non-renewable woody biomass by similar consumers were introduced under the CDM in response to the decision of the Conference of Parties (COP) "… the eligibility of land use, land-use change and forestry project activities under the CDM is limited to afforestation and reforestation" (decision 17/CP.7) and the CMP decisions as below.
>
> The CMP, by its decision 7/CMP.1, paragraphs 29 and 30 (December 2005):
>
> (a) "Welcomes the public call launched by the Executive Board for alternative methods for calculating emission reductions for small-scale project activities that propose the switch from non-renewable to renewable biomass";
>
> (b) "Requests the Board to develop, as a priority, a simplified methodology "for calculating emission reductions for small-scale project activities that propose the switch from non-renewable to renewable biomass".
>
> Then, the CMP, by its decision 2/CMP.3, paragraph 24 (December 2007):
>
> (a) "Requests the Executive Board to approve, at its first meeting in 2008, the simplified methodologies for "Switch from non-renewable biomass for thermal application by the user" and "Energy efficiency measures in thermal applications of non-renewable biomass", as recommended by the Executive Board, for use for clean development mechanism project activities, as contained in annexes 3 and 4 to document FCCC/KP/CMP/2007/3 (Part II), incorporating the necessary changes to ensure that **the application of these methodologies introduces new or improves existing end-user technologies and that, in the case of the methodology "Energy efficiency measures in thermal applications of nonrenewable biomass", the baseline energy efficiency is measured or is based on referenced literature values".**
>
> However, since the RMP does not include a specific guidance in this regard the Supervisory Body may wish to clarify whether it is necessary to keep this requirement and apply the fossil fuel emission factor.

31. Emission reductions are calculated as follows:

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y \quad \text{Equation (1)}$$

Where:

i	=	Indices for the situation where more than one type of project device is introduced to replace the pre-activity devices[6]
j	=	Indices for the situation where there is more than one batch of project device
ER_y	=	Emission reductions during year *y* (tCO_2e)
$ER_{y,i,j}$	=	Emission reductions by project device of type *i* and batch *j* during year *y* (tCO_2e)
LE_y	=	Leakage emissions in the year *y* (tCO_2e)

[6] For example, in some instances, full replacement of the pre-project device would require the implementation of more than one project device (e.g. one stove suitable for cooking and the other stove suitable for cooking/boiling water).

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{o,i,j} \times n_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\,fuel} \times BCF \quad \text{Equation (2)}$$

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved per cookstove device of type *i* and batch *j* during year *y* (tonnes)
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass[7] (fraction or %)
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected\_fossilfuel}$	=	[Emission factor of fossil fuels projected to be used to substitute non-renewable woody biomass by similar consumers (tCO_2e/TJ)]
$N_{0,i,j}$	=	Number[8] of activity devices of type *i* and batch *j* commissioned (number)
$n_{y,i,j}$	=	Proportion of commissioned activity devices of type *i* and batch *j* ($N_{0,i,j}$) that remain operating in year *y* (fraction)
μ_y	=	Adjustment to account for any continued use of pre-activity devices during the year *y*
BCF_y	=	Baseline Contraction Factor in year *y* (fraction) to adjust the baseline downwards to implement more stringent baselines over time

DRAFT

32. [For the emission factor of fossil fuels projected to be used to substitute non-renewable woody biomass by similar consumers, either the default regional[9] values in table 2 below or a value calculated from equation (3) may be used.

Table 2. Default regional values of the emission factor of fossil fuels projected to be used to substitute non-renewable woddy biomass by similar consumers

	Emission factor of fossil fuels projected to be used to substitute non-renewable woddy biomass by similar consumers ($t\ CO_2e/TJ$)
Middle East and North Africa	63.9
East Asia and the Pacific	85.7
Europe and Central Asia	57.8
Latin America and the Caribbean	68.6

7 Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/methodologies/standard_base/index.html>.

8 Activity devices may be commissioned in batches. See paragraph 16(a).

9 Refer to Appendix 1 for the definition of the regions which is primarily based on the "developing regions" classification used by the United Nations Development Programme but tailored to the purpose of this CDM methodology (Retrieved on 27.11.19 from <http://hdr.undp.org/en/content/developing-regions>).

	Emission factor of fossil fuels projected to be used to substitute non-renewable woddy biomass by similar consumers (t CO_2e/TJ)
South Asia	64.4
Sub-Saharan Africa	73.2

33. Activity participants may estimate the emission factor of fossil fuels projected to be used to substitute non-renewable woody biomass by similar consumersfor their project or programme of activity (PoA) by applying equation (3) below:

$$EF_{projected\_fossil\ fuel} = \sum_j x_j \times [EF_{FF,j,CO2} + (EF_{FF,j,CH4} \times GWP_{CH4}) + (EF_{FF,j,N2O} \times GWP_{N2O})]$$ Equation (3)

Where:

x_j	=	Percentage share of fossil fuel use[10] (a fraction representing the share of fossil fuel type *j* in total fossil fuel used in the region/country or project area for cooking)
$EF_{FF,j,CO2}$	=	CO_2 emission factor for the fossil fuel *j.* Use a value in the table 3 below (tCO_2/TJ)
$EF_{FF,j,CH4}$	=	CH_4 emission factor for the fossil fuel *j.* Use a value in the table 3 below (tCH_4/TJ)
$EF_{FF,j,N2O}$	=	N_2O emission factor for the fossil fuel *j.* Use a value in the table 3 below (tN_2O/TJ)
GWP_{CH4}	=	Global Warming Potential of CH_4 valid for the commitment period
GWP_{N2O}	=	Global Warming Potential of N_2O valid for the commitment period

Table 3. Default emission factors for fossil fuels (tonnes of GHG per TJ on a Net Calorific Value Basis)

Fuel	Default CO_2 Emission Factor	Default CH_4 Emission Factor	Default N_2O Emission Factor
Kerosene	71.9	0.01	0.0006
Liquefied Petroleum Gases (LPG)	63.1	0.005	0.0001
Coal	94.6	0.3	0.0015

***Source*:** Table 2.5, Chapter 2, 2006 IPCC Guidelines for National Greenhouse Gas Inventories]

[10] For example, if the percentage share of kerosene, LPG and coal in total fossil fuel used in the country X is 10%, 70% and 20%, then the parameter value for x_j should be 0.1, 0.7 and 0.2 respectively.

34. The value of fNRB shall be calculated using either of the following two options:

(a) **Ex ante:** the fNRB value is determined once at the validation stage, thus no monitoring and recalculation of the fNRB value during the crediting period is required;

(b) **Ex post:** the fNRB,y value is determined for the year y in the crediting period, requiring the fNRB value to be updated annually, following a consistent calculation procedure throughout the crediting period.

35. $B_{y,savings,i,j}$ due to implementation of efficient thermal devices is estimated as per any of the following options:

36. Option 1: Thermal Energy Output (TEO):

$$B_{y,savings,i,j} = \frac{HR_{y,i,j}}{NCV_{biomass}} \times \left(\frac{1}{\eta_{\text{old,i,j}}} - \frac{1}{\eta_{new,i,j}}\right) \quad \text{Equation (4)}$$

Where:

$HR_{y,i,j}$	=	Thermal energy output delivered per project device *i* in batch *j* during year *y* (TJ)
$\eta_{old,i,j}$	=	Efficiency of the old devices being replaced by activity devices of type *i* and batch *j* (fraction)
$\eta_{new,i,j}$	=	Efficiency of the project device *i* and batch *j* (fraction)

37. The thermal energy output shall be calculated based on the rated capacity of the project device multiplied by the number of utilization hours:

$$HR_{y,i,j} = HC_{i,j} \times t_{y,i,j} \times 3.6 \times 10^{-6} \quad \text{Equation (5)}$$

Where:

$HC_{i,j}$	=	Rated thermal capacity as per manufacturer specification (kW)
$t_{y,i,j}$	=	Number of hours of utilization of the device during the year *y* (hours)
3.6×10^{-6}	=	Factor to convert kWh to TJ

38. Option 2: kitchen performance test (KPT):

$$B_{y,savings,i,j} = B_{old,i,j} - B_{new,KPT,i,j} \quad \text{Equation (6)}$$

Where:

$B_{old,i,j}$	=	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate thermal energy equivalent to that provided by the project device type *i* and batch *j* (tonnes/year)
$B_{new,KPT,i,j}$	=	Annual quantity of woody biomass used in tonnes per project device of type *i* and batch *j*, measured as per the KPT protocol (tonnes/year)

39. Option 3: water boiling test (WBT):[11]

$$B_{y,savings,i,j} = B_{old,i,j} \times (1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}})$$ Equation (7)

$$B_{y,savings,i,j} = B_{y=1,new,i,j,survey} \times (\frac{\eta_{new,i,j}}{\eta_{old,i,j}} - 1)$$ Equation (8)

Where:

$B_{y=1,new,i,j,survey}$	=	Quantity of woody biomass used by activity devices in tonnes per device of type *i* and batch *j* (tonnes)

40. Option 4: controlled cooking test (CCT):

$$B_{y,savings,i,j} = B_{old,i,j} \times (1 - \frac{SC_{new,i,j}}{SC_{old}})$$ Equation (9)

Where:

SC_{old}	=	Specific fuel consumption or fuel consumption rate of the pre-activity devices (tonnes of fuel/unit output or tonnes of fuel/hour)
$SC_{new,i,j}$	=	Specific fuel consumption or the fuel consumption rate of the devices of type *i* and batch *j* deployed as part of the project (tonnes of fuel/unit output or tonnes of fuel/hour)

41. The calculations in the equations above assume that there is only one device per household. Considering that baseline surveys or other methods may estimate the total consumption per household, an adjusted formula as below shall be used in case more than one project device is used in the household. For example, if 2 activity devices are installed per household, 0.5 times the baseline woody biomass consumption per household ($B_{old,HH}$) is used as the total annual quantity of woody biomass that would have been used in the absence of the project activity in each device ($B_{old,i,j}$). Where more detailed data is available, e.g. the thermal capacity of the activity devices and respective utilisation hours, a weighted average thermal output ($HR_{y,i,j}$) may be used to determine the savings of baseline consumption for each device.

$$B_{old,i,j} = B_{old,HH} \div N_{d,HH}$$ Equation (10)

$$B_{old,HH} = B_{old,p} \times N_{p,HH}$$ Equation (11)

[11] Based on whether $\eta_{new,i,j}$ or $B_{y=1,new,ij,survey}$ is used for monitoring, either equation (7) or (8) may be used respectively.

Where:

$B_{old,HH}$	=	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate thermal energy equivalent to that provided by the activity devices (tonnes/household/year)
$N_{d,HH}$	=	Number of activity devices per household (number)
$B_{old,p}$	=	Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate thermal energy equivalent to that provided by the activity devices (tonnes/person/year)
$N_{p,HH}$	=	Average number of persons per household (number)

42. Where charcoal is used as the fuel by baseline (old) or project (new) devices, the quantity of woody biomass shall be determined by using a wood to charcoal conversion factor (CF).

43. The lifetime of each type of the activity devices shall be documented in the activity design document based on manufacturer's specification. The lifetime shall be tested in accordance with relevant international or national standards.

44. The loss in efficiency of the activity devices *i* in each batch *j* due to aging shall be accounted during the monitoring period. For Option 1: thermal energy output (TEO) (as specified in paragraph 36) and Option 3: water boiling test (WBT) (as specified in paragraph 39), the activity participant may choose any of the options below to account for the loss in efficiency (Option 3) or decrease in the capacity (Option 1); the option should be identified and fixed ex ante for the entire crediting period in the activity design document at the time of registration. However, when Option 2: kitchen performance test (KPT) (as specified in paragraph 38) or Option 4: controlled cooking test (CCT) (as specified in paragraph 40 above) is used, the requirements below are not applicable because any annual changes of the quantity of woody biomass used and any annual changes in specific fuel consumption will be captured by the KPT and CCT respectively[12]:

(a) A default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 30 ~~20~~ per cent shall be applied through the life span of the project device[13]; or

~~(b) Manufacturer of project devices shall confirm with technical justification based on certification by a national standards body or an appropriate certifying agent recognized by that body that no decrease in efficiency of project device is envisaged during the crediting period; or~~

[12] The KPT shall be conducted at representative households where the ICS has been regularly used since the beginning of the project activity in order to reflect the typical condition of the improved devices after aging. Similarly, the CCT shall be used to test the specific fuel consumption of representative devices that have been regularly in operation and subject to the regular process of replacement/maintenance introduced by the project activity since its beginning.

[13] If the efficiency of the activity devices falls below 30 ~~20~~ %, it is no longer eligible to be considered a project device.

(c) Determine[14] the rate of efficiency drop for a representative sample of the first batch of project device *i* in year *y* and assume that same rate of loss in efficiency applies to all other batches if stoves being deployed across the batches are similar. In other words, it may be assumed that the degradation of efficiency measured in a representative sample of the first batch of activity devices i apply to all subsequent batches. The efficiency of the activity devices in the first batch has to be monitored annually through representative samples and this rate of loss in efficiency may be applied correspondingly to all batches;

(d) Determine the loss in efficiency annually from a representative sample of each batch and use the actual loss rate that is measured.

45. Activity participants and coordinating/managing entities shall replace the project cookstoves whose lifetime has ended with new project cookstoves for the existing projects/CPAs as long as they are replaced within the crediting period. However, creating a new CPA or a new project for the same purpose is not allowed.

46. At the end of the life span of activity devices, one of the following three options shall be demonstrated:

(a) Activity devices are replaced with the same or more efficient devices;

(b) Activity devices are retrofitted/repaired i.e. essential parts of the stoves (e.g. the burning chamber) are replaced so as to meet the additional conditions described below;

(c) If none of the conditions above can be demonstrated, no emission reductions can be claimed for the stoves.

47. If activity devices are retrofitted/repaired before or at the end of the device's estimated life span, emission reductions may be claimed for these devices during the extended lifetime only if the details of the retrofits/repairs undertaken (e.g. parts replaced, specifications followed, personnel conducting the repairs and date of retrofitting) on each device are documented and in addition, one of the following options is implemented:

(a) Extended lifetime is demonstrated through a warranty from the original manufacturer, or a guarantee from a company with demonstrated experience in cookstove repair that assures the performance of the stove in its entirety comparable to the original device including with regard to efficiency, safety and indoor emissions; or

(b) Extended lifetime or the durability of the retrofitted device is demonstrated through a durability test performed according to requirements in ISO 19867-1 for durability or a comparable national standard. Certification by a relevant national standards body or an appropriate certifying agent recognized by that body (with reference to Data/Parameter Table 20 of the methodology) may be supplied based on sample tests specified by the standard applied.

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[14] Example: For the representative sample of Batch 1, if the efficiency of a new project device is 40% and at the end of Year 1, the efficiency is monitored to be 39%; the loss rate is (40%-39%)/1=1%. Then this 1% loss rate is to be assumed to be applicable for all the devices in the first batch and subsequent batches for first year of operation.

4.4. Leakage

Draft Requirements

Avoid leakage where applicable

26. Paragraph 33 of the RMP states that the 'Mechanism methodologies shall avoid leakage, where applicable'.

27. Leakage is the net change of anthropogenic emissions by sources of greenhouse gases (GHGs) which occurs outside the project boundary, and which is measurable and attributable to the Article 6.4 activity, as applicable.

28. Mechanism methodologies shall:

(a) Ensure that the potential sources of leakage in a typical activity covered by the mechanism methodology are identified, including, but not limited to, used equipment transferred outside of the project boundary and diversion of resources from other activities, or diversion of production or service provision;

(b) Include provisions to avoid or minimize all sources of leakage as far as possible;

(c) Quantify the leakage that cannot be avoided and deduct it from the emission reduction achieved by the Article 6.4 activities;

(d) Require the activity participant to follow any guidance from the designated national authority (DNA) of the host Party on leakage, where available.

29. For some classes of activities, monitoring at jurisdictional level may be necessary to quantify and account for leakage. In addition, further work will be required to assess the implications of activities implemented outside national borders and transboundary activities. Supervisory Body will develop further guidance in this regard at a future meeting of the Supervisory Body.

48. Activity participants applying this methodology shall avoid leakage, where applicable by:

(a) Identifying the potential sources of leakage, such as baseline equipment transferred outside of the project boundary or used equipment deployed as activity technology, diversion of production or service provision;

(b) Describing provisions that will be implemented to avoid or minimize all sources of leakage;

(c) Applying approaches to quantify the leakage that cannot be avoided and deduct it from the emission reduction achieved by the Article 6.4 activity;

(d) Following any guidance from the DNA of the host Party on leakage.

Rationale for changes

The above requirements are self explanatory.

49. Leakage related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). The potential source of leakage due to the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources shall be considered. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass by the non-project households/users, that is attributable

to the project activity, then $B_{old,i,j}$ is adjusted to account for the quantified leakage. Alternatively, $B_{y,savings,i,j}$ is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

50. Project activities switching from baseline device using firewood to efficient project device using charcoal or switching from firewood to efficient project device using processed biomass (briquette, pellets, and woodchips) shall take into account the leakage effects related to the charcoal or processed biomass production.

51. A default value of 0.030 t CH_4/t charcoal may be used in accordance with AMS-III.BG.

4.5. Data and parameters not monitored

52. In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data / Parameter table 1.

Data / Parameter:	x_j
Data unit:	Fraction
Description:	Percentage share of fossil fuel use (a fraction representing the share of fossil fuel type *j* in total fossil fuel used in the region/country or project area for cooking)
Source of data:	Published literature, official reports or statistics, surveys
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$B_{old,p}$
Data unit:	tonnes/person/year
Description:	Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate thermal energy equivalent to that provided by the activity devices
Source of data:	Where applicable a value from a standardised baseline may be used as an alternative to the default value provided
Measurement procedures (if any):	Determined ex ante using one of the following options: (a) A default value of ~~0.5~~ 0.4. This option is limited to household activity devices (not eligible for oven and dryers). If project proponents wish to use the default value for insitutions (e.g. schools, prisons), the value should be adjusted, based on the number of meals cooked[15]; (b) ~~Historical data or~~ A sample survey conducted as per the latest version of the “Standard: Sampling and surveys for Article 6.4

[15] For example, in case of day schools, only one meal may be prepared by schools and provided to students and staff, except during school holidays when the use of fuel may not be siginficant.

	activities and programme of activities". If the estimated value is above 0.9, it should be capped at 0.9; (c) Country or region specific values approved through the "procedure for development, revision, clarification and update of standardized baselines"
Any comment:	

Rationale for changes

The values reported in almost all active CDM projects and Gold Standard projects were analysed. For converting per capita value and per household value, information on household size from the United Nations Department of Economic and Social Affairs was used. The table 2 below provides a summary of the information compiled.

Table 2. Annual average woodfuel consumption per capita and per household by region based on values reported in project design documents (PDDs)

Region[(a)]	Annual average woodfuel consumption per capita (tonnes/capita/year)				
	No. of PDDs	Mean	SD[(b)]	Mean - SD	Q1[(c)]
Sub-Saharan Africa	58	0.87			
Eastern	38	0.89			
Middle	1	0.75			
Southern	4	1.14			
Western	15	0.77			
Latin America and the Caribbean	6	1.11			
Eastern Asia, South-eastern Asia and Oceania	10	0.95			
Southern Asia	35	0.40			
Europe and Central Asia	0	-			
Western Asia and North Africa	0	-			
Total (global average)	109	0.74	0.39	0.35	0.32

(a) According to subregions defined by the United Nations. https://unstats.un.org/unsd/methodology/m49/.
(b) Standard deviation.
(c) First quartile or 25th percentile.

Per capita and per household fuelwood consumption for cooking were calculated based on data from the United Nations[16] and Demographic and Health Surveys (DHS) Program[17]. The actual total population that uses firewood was considered rather than the total population. DHS data were only available for 58 countries, the majority of which are in Sub-Saharan Africa. A summary of the findings is presented in table 3 below.

Table 3. Annual average woodfuel consumption per capita and per household by region based on values reported by the United Nations and Demographic and Health Surveys Program

[16] https://data.un.org/.

[17] https://dhsprogram.com/.

Region	Annual average woodfuel consumption per capita (tonnes/capita/year)				
	No. of countries	Mean	SD	Mean - SD	Q1
Sub-Saharan Africa	33	0.59			
Eastern	13	0.58			
Middle	5	0.65			
Southern	3	0.78			
Western	12	0.53			
Latin America and the Caribbean	8	1.10			
Eastern Asia, South-eastern Asia and Oceania	7	0.44			
Southern Asia	5	0.57			
Europe and Central Asia	4	0.32			
Western Asia and North Africa	1	0.59			
Total (global average)	58	0.62	0.45	0.17	0.27

Several studies[18] that have undertaken Kitchen Performance Tests (KPTs) were also reviewed. Generally, the lower end of baseline woodfuel consumption observed is about 0.36 tonnes/capita/year, and the upper end is around 1.1 tonnes/capita/year.

Based on the analysis above, the following observations can be made:

- From the analysis based on PDDs, the global average per capita value is 0.74 tonnes/capita/year, one standard deviation is 0.39, median is 0.74 and the 1st quartile is 0.32;
- From the analysis based on UN and DHS data, the global average per capita value is 0.62 tonnes/capita/year, one standard deviation is 0.45, median is 0.5 and the 1st quartile is 0.27;
- The current default value of 0.5 tonnes/capita/year is below the global average values derived from both analyses above.

The value of 0.5 tonnes/capita/year specified under CDM methodology version 12 is conservative compared to the values reported in the PDDs. However, based on the UN and DHS

[18] Garland, C., and others (2015), Impacts of household energy programs on fuel consumption in Benin, Uganda, and India. Energy for Sustainable Development 27, pp. 168–173.

Johnson, M.A., and others (2013), Impacts on household fuel consumption from biomass stove programs in India, Nepal, and Peru. Energy for Sustainable Development 17, pp. 403–41.

Ventrella, J., and others (2020), An international, multi-site, longitudinal case study of the design of a sensor-based system for monitoring impacts of clean energy technologies. Design Studies 66, pp. 82–113.

Wallmo, K. and Jacobson, S.K. (1998), A social and environmental evaluation of fuel-efficient cook-stoves and conservation in Uganda. Environmental Conservation 25, pp. 99–108.

Granderson, J., and others (2009), Fuel use and design analysis of improved woodburning cookstoves in the Guatemalan Highlands. Biomass and Bioenergy 33, pp. 306–315.

Berrueta, V.M., and others (2008), Energy performance of wood-burning cookstoves in Michoacan, Mexico. Renewable Energy 33, pp. 859–870.

data, it was found that the average values for over half of countries for which data is available were equal to or lower than 0.5. It is thus recommended that the default values are specified as 0.4 tonnes/capita/year in order to ensure that it is an ambitious benchmark and is consistent with the approach for the baselines under the RMP.

Data / Parameter table 3.

Data / Parameter:	$N_{p,HH}$
Data unit:	Number
Description:	Average number of persons served per household prior to the activity implementation
Source of data:	Established ex ante prior to activity implementation based on records of households served by the activity
Measurement procedures (if any):	-
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$B_{old,HH}$
Data unit:	tonnes/household/year
Description:	Annual quantity of woody biomass that would have been used in the household in the absence of the activity to generate thermal energy equivalent to that provided by the activity devices
Source of data:	This parameter shall be determined ex ante
Measurement procedures (if any):	Use one of the following options: 1. $B_{old,p}$ times $N_{p,HH}$ or; 2. Based on the historical data or a sample survey conducted as per the latest version of "Standard: Sampling and surveys for Article 6.4 activities and programme of activities". For user reported surveys, a 95 per cent confidence interval and a [x] [5] per cent margin of error shall be achieved. When this option is selected, the average values and standard deviation shall be calculated and the lower bound of the 95 per cent confidence interval shall be used. 3. If the monitoring period is shorter or longer than one year, the result may be extrapolated for the monitoring period
Any comment:	The value may be derived, based on the historical data or a sample survey conducted as per the latest version of "Standard: Sampling and surveys for Article 6.4 activities and programme of activities". In all cases average values based on surveyed data shall be adjusted downwards by taking the lower bound of the 95 per cent confidence interval.

Rationale for changes

The proposed approach corresponds to one of the baseline approaches in paragraph 36 of the RMP *i.e. an approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 above'.*

Data / Parameter table 5.

Data / Parameter:	$\boldsymbol{B_{old,i,j}}$
Data unit:	tonnes/year
Description:	Annual quantity of woody biomass that would have been used in the absence of the activity to generate thermal energy equivalent to that provided by the activity device type *i* and batch *j*
Source of data:	This parameter shall be determined ex ante
Measurement procedures (if any):	$B_{old,HH}$ divided by $N_{d,HH}$
Any comment:	$B_{old,i,j}$ equals $B_{old,HH}$ when only one activity device per household is distributed. For $N_{d,HH}$, please refer to Data / Parameter table 23

Data / Parameter table 6.

Data / Parameter:	$\boldsymbol{f_{NRB}}$
Data unit:	Fraction or %
Description:	Fraction of woody biomass saved by the activity during year *y* that can be established as non-renewable biomass
Source of data:	-
Measurement procedures (if any):	Determined using one of the following options: (a) Calculate a fNRB value as per TOOL30. If the calculated value surpasses 0.6, it should be limited to 0.6; or (b) Use the default value of 0.3; or (c) Use a default value included in an approved standardized baseline
Any comment:	-

Rationale for changes

The activity participants have three options when determining fNRB values, i.e. use a default value of 0.3, use values approved through the standardized baseline procedures, if available, or calculate fNRB values using TOOL30 of the CDM.

Under the CDM, only four countries[19] developed new default country-specific fNRB values using TOOL30, following the standardized baseline procedure.

[19] Uganda (ASB0002-2017), Rwanda (ASB0041-2018), Ethiopia (ASB0044-2019) and Myanmar (ASB0049-2020).

A vast majority of the registered project activities and PoAs under the CDM are using fNRB values above 0.8, with the highest value of 1.0 (Bangladesh) but none below 0.6, and those values were calculated using the outdated method and values.

Based on the assessment of pan-tropical woodfuel supply and demand, Bailis, et al., (2015)[20] estimated the global fNRB value was 27 to 34 per cent, with large geographic variations.

Table 4. Regional fraction of non-renewable biomass values

Region	fNRB
Africa	35 – 41%
Latin America and Carribean	21 – 31%
Asia & Oceania	24 – 30%
Total	27 – 34%

Source: Table 15 of supplementary information to Bailis, et al., (2015).

Other studies that have estimated the share of non-renewable biomass are given in table 2 below.

Table 5. Fraction of non-renewable biomass values reported in other studies

	Area	Source
41 – 43%	India and China	Cashman, S., Rodgers, M., Huff, M., Feraldi, R. and Morelli, B. (2016), Life Cycle Assessment of cookstove fuels in India and China. Washington, DC U.S.A. Environmental Protection Agency
0 – 89%	Uganda	Zanchi, G., Frieden, D., Pucker, J., Bird, D. N., Buchholz, T. and Windhorst, K. (2013), Climate benefits from alternative energy uses of biomass plantations in Uganda. Biomass and Bioenergy, 59, pp. 128–136
0 – 96%	Mexico	Ghilardi, A., Guerrero, G. and Masera, O. (2009), A GIS-based methodology for highlighting fuelwood supply/demand imbalances at the local level: A case study for Central Mexico. Biomass and Bioenergy, 33, pp. 957–972
42 – 64%	Kenya	Drigo, R., Bailis, R., Ghilardi, A. and Masera, O. (2015), WISDOM Kenya, GACC Yale-UNAM Project

Based on the performance-based approach relying on an ambitious benchmark, it is proposed to cap the value of fNRB at 0.6, in addition to the conservative default value of 0.3.

Data / Parameter table 7.

Data / Parameter:	SC_{old}
Data unit:	tonnes of fuel/unit output or tonnes of fuel/hour
Description:	Specific fuel consumption or fuel consumption rate of the pre-activity devices
Source of data:	

[20] Bailis, R., Drigo, R., Ghilardi, A. and Masera, O. (2015), The carbon footprint of traditional woodfuels. Nature Climate Change, 5(3), pp. 266–272.

Measurement procedures (if any):	1. Specific fuel consumption or fuel consumption rate of the pre-activity devices, that is fuel consumption per quantity of item/s processed (e.g. food cooked) or fuel consumption per hour, respectively. Specific fuel consumption or fuel consumption rate are to be determined using the CCT protocol carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the CCT Protocol listed by Clean Cooking Alliance (See https://www.cleancookingalliance.org/technology-and-fuels/testing/protocols.html)). 2. Use weighted average values if more than one type of device is being replaced (taking the amount of woody biomass consumed by each device as the weighting factor). 3. When the CCT is conducted on a sample basis, the sampling requirements indicated in section 5.2 and guidance provided in the "Standard for sampling and surveys for Article 6.4 activities and programme of activities" shall be followed. 4. The sample CCT results shall be adjusted downwards by taking the lower bound of the 90 per cent confidence interval.
Any comment:	

Rationale for changes

The proposed approach corresponds to one of the baseline approaches in paragraph 36 of the RMP, *i.e. an approach based on existing actual or historical emissions, adjusted downwards to ensure alignment with paragraph 33 above'.*

Data / Parameter table 8.

Data / Parameter:	$HC_{i,j}$
Data unit:	kW
Description:	Rated capacity for delivering heat as per manufacturer specification (kW)
Source of data:	-
Measurement procedures (if any):	The thermal energy shall be calculated based on the rated capacity of the activity device multiplied by the number of utilization hours. Refer equation 5
Any comment:	-

Data / Parameter table 9

Data / Parameter:	$\eta_{old,i,j}$
Data unit:	Fraction
Description:	Efficiency of pre-activity device
Source of data:	-
Measurement procedures (if any):	The parameter may be established based on a representative sample survey of the pre-activity devices and fixed ex ante (i.e. there is no need to determine baseline efficiency for each individual household

	when including in the activity database). The survey is to be conducted in the applicable geographical area in line with the “Standard for sampling and surveys for Article 6.4 activities and programmes of activities”. The representative sampling survey may ask whether the pre-activity device is a traditional three-stone fire or another conventional device with no improved combustion air supply or flue gas ventilation. The default values for the efficiency of pre-activity device used for cooking and/or water boiling applications are as follows: a) For a three-stone fire using firewood (not charcoal), or a cookstove with no improved combustion air supply or flue gas ventilation (i.e. without a grate or a chimney), the default value is ~~0.10~~ 0.15; b) For other type of devices, the default value is ~~0.20~~ 0.25. In that case, it is possible not to conduct efficiency tests and to use the default efficiency values and to calculate the efficiency of pre-activity device as a weighted average value. Furthermore, activity participants may also conservatively assume that the efficiency of pre-activity device is the highest among the default efficiency values. In this case, there is no need to conduct a survey to determine the weighted average efficiency.
Monitoring frequency:	This parameter may be established prior to implementation of a activity
QA/QC procedures:	-
Any comment:	-

Rationale for changes

As per the requirements above, activity participants may determine the efficiency of pre-activity devices by conducting a questionnaire survey to estimate the percentage share of different stove types and then calculate the weighted average value.[21]

The efficiency values reported in CDM project documentation for pre-project stoves used in CDM projects/PoAs were analysed with regard to the data sources used to determine the values. Out of 217 cases analysed:

a) 69 per cent used a default efficiency of 0.1;

b) 26 per cent used a value between 0.1 and 0.2, by calculating a weighted average value based on the percentage share of 0.1 type stoves and 0.2 type stoves;

c) 2 per cent used a default efficiency of 0.2;

d) 2 percent used an efficiency value higher than 0.2;

e) 1 per cent used standardized baseline values approved by the CDM Executive Board.

[21] For example, assume that the percentage shares of three-stone fire (15% efficiency), conventional stoves (25% efficiency) and improved stoves (40% efficiency) are 15 per cent, 80 per cent and 5 per cent, respectively. In this case, weighted average efficiency value is calculated as 24 per cent (= 0.15 x 0.15 + 0.25 x 0.80 + 0.40 x 0.05).

Clean Cooking Alliance developed the Clean Cooking Catalog,[22] which is a global database of cookstoves, fuels, fuel products and performance data. It includes information on features and specifications, as well as emissions, efficiency and safety based on laboratory and field-testing. The Catalog contains data from over 700 sets of test results, including both third-party and self-reported data on performance and safety. Table 7 below summarizes the information in the Catalog.

Table 7. Thermal efficiency values of cookstoves reported in Clean Cooking Catalog

Type[(a)]	No. of stoves tested	Mean	SD	Mean + SD
Three-stone fires using firewood	11	16.6	3.5	20.1
Traditional firewood stoves	9	22.1	7.8	29.9
Traditional charcoal stoves	4	21.8	3.2	25.0
Non-traditional firewood stoves	93	30.2	10.5	40.7
Non-traditional charcoal stoves	33	32.5	8.2	40.7

(a) "Traditional" refers to local methods of cooking using cultural practices and methods. "Non-traditional" refers to newer stove technology designed to improve efficiency, cleanliness and/or safety. http://catalog.cleancookstoves.org/glossary#stove-characteristics.

Unlike in the case of traditional or non-traditional (improved) stoves, in the case of three-stone fires, the variables that affect the efficiency are the characteristic of fuelwood used, such as the calorific value, moisture content, ambient weather conditions and type of cooking vessel used. Stoves themselves are undefined for this case.

A default value of 10 per cent efficiency for three-stone fires was included in the first versions of the CDM methodology approved before 2010 based on references available at the time (e.g. Bhattacharya et al., 2002).[23]

It is acknowledged that in the table above, as compared to non-traditional stoves, the number of data points available for three-stone fires and traditional stoves is limited.

However, balance of evidence suggests that there is a need to set a conservative value for the efficiency of three-stone fires to replace the currently indicated 10 per cent efficiency, based on more recent studies.

The following new default values are proposed for an ambitious and conservative benchmark:

a) The default values for the efficiency of pre-project device used for cooking and/or water boiling applications are as follows:

   i. For a three-stone fire using firewood (not charcoal), or a cookstove with no improved combustion air supply or flue gas ventilation (i.e. without a grate or a chimney), the default value is 0.15;

   ii. For other type of devices, the default value is 0.25.

[22] http://catalog.cleancookstoves.org/.

[23] Bhattacharya, S.C., Albina, D.O. and Salam, P.A. (2002), Emission factors of wood and charcoal-fired cookstoves. Biomass and Bioenergy 23, pp. 453-469

Data / Parameter table 10.

Data / Parameter:	***CF***
Data unit:	-
Description:	Wood-to-charcoal conversion factor
Source of data:	One of the following three options should be used to determine this factor: i) The default value of 4 may be used; ii) Activity participants may determine the factor applicable to their region based on a sample of tests of kilns. In this case, the activity participants should provide a clear description of the testing method used including the standard followed and the sampling approach; iii) Activity participants may use country or region specific values included in an approved and valid standardized baseline
Measurement procedures (if any):	-
Any comment:	-

Rationale for changes

The Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Reference Manual (Chapter 1: Energy) states, "…*the wood-to-charcoal factor is stated to be between 4 and 8. If no local information is available, 6 kg of wood input per kg of charcoal may be used as default (FAO, 1990*[24]*). In many developing countries, there are usually no cross checks on the quality of charcoal. Consequently, substandard charcoal will be passed on as charcoal. Typical wood to charcoal conversion factors in many developing countries would range from 2.5 to 3.5 and rarely beyond this. This also implies that the carbon fraction of charcoal is around 0.6 to 0.7*." No specific information is found in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories or in its 2019 Refinement.

Based on a review of project design documents (PDDs), component project activity design documents and monitoring reports for 19 project activities and PoAs involving the use of charcoal cookstoves, it was found that 14 project activities and PoAs used the default factor of 6 provided in the CDM methodology, while five PoAs used values based on literature. As shown in table 8 below, not all literature is peer-reviewed or publicly available.

Table 8. Conversion factor values reported in project design documents and monitoring reports

	Conversion factor	Comments on literature cited
PoA 9981 (Mozambique)	7.14	Publication dated September 2004[(a)]
PoA 9666 (Togo)	7	Baseline survey undertaken by an independent third-party consulting firm; Baseline report dated July 2011[(b)]
PoA 7359 (Kenya)	10	Source published in March 2011 by the Forests Philanthropy Action Network[(c)]
PoA 7359 (Madagascar)	12	Government report from Ministry of Energy[(d)]
PoA 6207 (Rwanda)	9	Source published in 2017 by USAID[(e)]

[24] FAO (1990), FAO Yearbook, Forest products 1979–1990, FAO Forestry series no. 25. FAO Statistics series no. 103, Food and Agricultural Organization of the United Nations, Rome, Italy.

(a) Brouwer, R. and Falcão, M. P. (2004), Wood fuel consumption in Maputo, Mozambique. Biomass and Bioenergy. Volume 27, Issue 3, September 2004, pp. 233–245.
(b) HED Consulting (2011), Togo Baseline Report.
(c) Forests Philanthropy Action Network (2011), Protecting and restoring forest carbon in tropical Africa, Chapter 6: Wood fuels and forests in tropical Africa (http://files.forestsnetwork.org/FPAN_LR.pdf).
(d) Ministry of Energy, Madagascar (2012), Diagnostic Du Secteur Energie a Madagascar, p. 21.
(e) USAID (2007), Improved cookstoves in Rwanda, version 2.0, Standardized Crediting Framework Rwanda Pilot: http://climateportal.rema.gov.rw/rules-of-scf.

In comparision to the 1996 IPCC guidelines cited above, there is more recent information in FAO publications. A wood-to-charcoal factor of 4.4 is indicated in Unified bioenergy terminology (FAO, 2004),[25] to be used for the FAOSTAT Statistical Database.

The typical yield of charcoal from fuelwood using different types of kilns is shown in table 9 below.

Table 9. Fuelwood requirement for charcoal production (tonne of wood/tonne of charcoal)

Kiln type	Fuelwood moisture (%, dry basis)					
	15	20	40	60	80	100
Earth kiln	7.3	9.4	11.6	15.2	17.4	19.6
Portable steel kiln	4.4	5.1	6.5	9.4	10.9	11.6
Brick kiln	4.4	4.4	5.1	7.3	8.0	8.7

Source: FAO, 2004, assuming that the density of dry wood is 0.725 t/m^3

A 2017 FAO report[26] indicates that some modern kilns require only 3 kg of wood to produce 1 kg of charcoal, whereas a traditional kiln might require up to 12 kg. The same report also indicates that after treefelling, small-sized canopy branches are rarely used in charcoal production, resulting in large amounts of wood waste on sites. In addition, it indicates that charcoal losses at the production sites and in the transportation and distribution stage of the value chain are significant (10 to 35 per cent).

Further, Chidumayo, E.N. and Gumbo, D. J. (2013)[27] analysed the wood-to-charcoal conversion rate data for 209 charcoal kilns in Africa, South America and Asia, and proposed a mean wood-to-charcoal conversion rate of 4.9, while the conversion rate for the most commonly used kilns was found to be 5.3. Santos, M.J. et al. (2017)[28] assumed a conversion rate of 5 in their study. Also, in the experimental study conducted by Saravanakumar, A. et al. (2006)[29] to test charcoal production in a partial combustion kiln, the conversion rate used was as low as 4.

Table 10. Wood-to-charcoal conversion factor values reported in literature

[25] FAO (2004), Unified bioenergy terminology, Food and Agricultural Organization of the United Nations, Rome, Italy. http://www.fao.org/3/j4504e/j4504e00.pdf.

[26] FAO. (2017). The charcoal transition: greening the charcoal value chain to mitigate climate change and improve local livelihoods, by J. van Dam. Rome, Food and Agriculture Organization of the United Nations.

[27] Chidumayo, E.N. and Gumbo, D. J. (2013). The environmental impacts of charcoal production in tropical ecosystems of the world: A synthesis, Energy for Sustainable Development, 17(2), pp. 86–94.

[28] Santos, M.J., Dekker, S.C., Daioglou, V., Braakhekke, M.C. and van Vuuren, D.P. (2017). Modeling the effects of future growing demand for charcoal in the tropics, Frontier in Environmental Science, 5(28).

[29] Saravanakumar, A. and Haridasan, T.M. (2006). A novel performance study of kiln using long stick wood pyrolytic conversion for charcoal production. Energy, Education, Science and Technology, 31(2), pp. 711–722.

Country/Region	Conversion factor	Source
India	4	Saravanakumar, A. and Haridasan, T.M. (2006)
Global	5	Santos, M.J., Dekker, S.C., Daioglou, V., Braakhekke, M.C. and van Vuuren, D.P. (2017)
Global	4.9 for mean value; 5.3 for most commonly used kilns (3.9 for surface earth mound kiln; 6.0 for casamance surface earth mound kiln; and 8.5 for pit mound kiln)	Chidumayo, E.N. and Gumbo, D. J. (2013)

Furthermore, Energypedia reported various types of kilns and respective efficiencies, with kiln efficiencies of 8 to12 per cent for traditional kilns and 25 to 33 per cent for the most advanced kilns.

Table 11. Efficiencies of various types of kilns

	Conversion factor	Kiln efficiency
Traditional kilns	8 – 12	8 – 12%
Improved traditional kilns	6 – 8	12 – 17%
Industrial production technologies	5 – 7	20 – 14%
New high-yield, low-emission systems	3 – 4	25 – 33%

Source: Energypedia, Table 7[30]

While noting that the conversion factor could vary with charcoal production technique and several other factors (e.g. type of kiln, moisture content of wood, weather conditions), a conservative performance benchmark should be used as a default value. Consistent with guidance on baselines under the RMP, a default value of 4 is recommended because it is the lower end of the range indicated in most literature reviewed, including FAO (2017), FAO (2004), Chidumayo, E.N. and Gumbo, D. J. (2013), and Energypedia.

Therefore, the default value of 6 has been revised to 4.

[30] https://energypedia.info/wiki/Charcoal_Production.

5. Monitoring methodology

Draft Requirements

Including data sources and accounting for uncertainty

45. Paragraph 34 of the RMP states that 'Mechanism methodologies shall include relevant assumptions, parameters, data sources and key factors'.

46. The Supervisory Body should ensure that the mechanism methodologies are transparent, comprehensive and comprehensible and include relevant assumptions, parameters, data sources and key factors. Where relevant, requirements shall be expressed in terms of performance rather than specification of a product, and these requirements should be verifiable.

47. If it is necessary to invoke a requirement in a methodology that appears elsewhere in another methodology, this should be done by reference and not by repetition. If a test method or a procedure is, or is likely to be, applicable to two or more methodologies, a tool shall be prepared on the method itself, and each methodology shall refer to it to prevent potential deviations on account of repetitions.

53. This methodology includes assumptions, parameters, data sources and key factors applicable to activities under this methodology. Where required, the activity participant shall transparently and clearly describe additional parameters and assumptions and the data sources associated with the parameters, and include a definition of uncertainty and related adjustments where relevant.

Rationale for changes

The requirement ensures that the emissions due to the activity are real, transparent and measurable. Further, it also minimizes the risk of non-permanence of emission reductions over multiple NDC implementation periods.

54. During activity implementation, the following data shall be recorded:

(a) Number of new devices distributed under the activity, identified by the type of devices and the date of commissioning (See Data / Parameter tables 21 and 22);

(b) Data to unambiguously identify the recipient of the new devices distributed under the activity (e.g. name, address, phone number).

55. In order to assess the leakage described in section 4.4 above, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources). Other data on non-renewable woody biomass use required for leakage assessment shall also be collected.

56. Relevant parameters shall be monitored and recorded during the crediting period as indicated in section 5.1 below.

5.1. Data and parameters monitored

Data / Parameter table 10.

Data / Parameter:	$N_{0,i,j}$
Data unit:	Number
Description:	Number of commissioned activity devices of type *i* and batch *j*
Source of data:	Monitoring
Measurement procedures (if any):	As per paragraph 0
Monitoring frequency:	
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 11.

Data / Parameter:	$n_{y,i,j}$
Data unit:	Fraction
Description:	Proportion of commissioned activity devices of type *i* and batch *j* ($N_{0,i,j}$) that remain operating in year *y* (fraction)
Source of data:	Monitoring
Measurement procedures (if any):	Measured directly or based on a representative sample. The “Standard: Sampling and surveys for Article 6.4 activities and programme of activities” shall be used for determining the sample size to achieve 90/10 confidence/precision levels when using data sensors/loggers or pay-as-you-go system[31], else [95/05] [95/0x] confidence/precision levels shall be achieved for user reported surveys. Separate samples shall be taken for each batch
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 12.

Data / Parameter:	μ_y
Data unit:	Fraction
Description:	Adjustment to account for any continued use of pre-activity devices during the year *y*
Source of data:	When applying equations 7 and 9, it is a fraction based on monitoring results. In other cases (i.e. applying equations 4, 6 and 8), use 1.0

[31] A pay-as-you-go (PAYGO) system is one in which one pays for a service before using it and one cannot use more than what has been paid for. PAYGO models such as smart fuel canisters and mobile money payment systems aim to enable both stove financing and sale of clean fuel in more affordable quantities.

Measurement procedures (if any):	This parameter should be monitored using one of the following methods: 1. If it is found during the ex-post surveys that both the activity devices and pre-activity devices are being used together, measurement campaigns shall be undertaken using data loggers/sensors such as stove utilization monitors (SUMs) which can log the operation of all devices (recording the situation of the device being used or not during any day *'d'* of the measurement campaign) in order to determine the average device utilization intensity (to establish the relative share of the usage of the devices). The measurement campaign shall be conducted in ~~at least 10~~ randomly selected participant households of the activity or the component project activity (CPA) in accordance with the "Standard: Sampling and surveys for Article 6.4 activities and programme of activities" using a 90/10 precision for sample selection ~~for at least 90 days during the year *y*. If seasonal variation is observed, the average value determined through the campaign shall be annualised taking into account seasonal variation of device utilization~~. If this option is chosen by activity participants, the value determined using the data loggers/sensors shall be applied. 2. Alternatively, questionnaire surveys may be conducted using [95/05] [95/0x] confidence/precision for the sampling surveys in accordance with the "Standard: Sampling and surveys for Article 6.4 activities and programme of activities" ~~if the use of data loggers to record the continued operation of baseline devices is demonstrated to be not practical, for example when the baseline device is the three-stone fire~~. The surveys should be designed to capture the cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidences to determine the frequency of usage of both the activity devices and baseline devices. For example, if there were 3 pre-activity devices per household and it was determined during the survey that use of one of them continues during the crediting period then a conservative adjustment factor of 0.66 is applied for the relevant monitoring period. Another example would be the case where there was only one pre-activity device per household and its use during the activity period continues along with the project stove to meet 25% of the cooking needs of the household in which case the adjustment factor will be 0.75. Where a more precise data is available, i.e. the thermal capacity of the activity and pre-activity devices and respective utilization hours, a weighted average adjustment factor may be used. If this option is chosen by activity participants, the average minus one standard deviation value determined using the questionnaire surveys shall be applied
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedures:	-
Any comment:	1. If equation (8) under option 3 (WBT) is used combined with direct measurement of $B_{y=1,new,i,j,survey}$, then $\boldsymbol{\mu_y}$ may be assumed as 1.0. For subsequent years, the value of 1.0 may be applied, only if it can be demonstrated through either measurement campaign or questionnaire survey for a sample of households established

	according to the "Standard: Sampling and surveys for Article 6.4 activities and programme of activities" that pre-activity devices are not used in parallel with the activity devices during the monitoring period. This is required even in cases where pre-activity devices were demonstrated to be decommissioned ex ante in order to ensure that such devices and alike have not been reintroduced. Otherwise, measurement campaign or equivalent shall be undertaken to determine this parameter. Activity participants may choose to directly monitor the biomass consumption annually in the project device" instead of determining μ_y by measurement campaign or survey in a similar manner as the measurement of $B_{y=1,new,i,j,survey}$. 2. When the data loggers are used, the days when only activity devices or only pre-activity devices are used will be attributed accordingly. The days where both devices have been used, if the data loggers are able to detect and record the time each device has been used (e.g. in hours), the share in the total duration of utilization will be used to attribute a fraction of this day to one or to the other device. Alternatively, if the data loggers are not able to determine the duration of the utilization, but only the situation of the device being on or off (i.e. used or not used during that day), the share of 50:50 may be used

Rationale for changes

Generally, there is a continued use of pre-project cookstoves alongside the project cookstoves in various CDM project activities and PoAs. Many studies found that the continued use of traditional/baseline stoves remained high (Dickinson et al., 2019[32]; Ochieng et al., 2020[33]; Piedrahita et al., 2016[34]; Shankar et al., 2020[35]).

According to the literature reviewed, households continue to stove-stack for several reasons, including:

- Inability of primary cookstove to cook all dishes (Dickinson et al., 2019; Jewit et al., 2020[36]; Ochieng et al., 2020; Piedrahita et al., 2016);
- Time-saving from parallel cooking (Ochieng et al., 2020);

[32] Dickinson L. K., Piedrahita R., Coffey R. E., Kanyomse E., Alirigia R., Molnar T., Hagar Y., Hannigan O. M., Oduro R. A., & Wiedinmyer C. (2019). Adoption of improved biomass stoves and stove/fuel stacking in the REACCTING intervention study in Northern Ghana. Energy Policy.

[33] Ochieng A. C., Yabei Z., Nyabwa K. J., Otieno I. D., & Spillane C. (2020). Household perspectives on cookstove and fuel stacking: A qualitative study in urban and rural Kenya. Energy for Sustainable Development.

[34] Piedrahita R., Dickinson L. K., Kanyomse E., Coffey E., Alirigia R., Hagar Y., Rivera I., Oduro A., Dukic V., Wiedinmeyer C., & Hannigan M. (2016). Assessment of cookstoves stacking in Northern Ghana using surveys and stove use monitors. Energy for Sustainable Development.

[35] Shankar V. A., Quinn K. A., Dickinson L. K., Williams N. K., Masera O., Charron D., Jack D., Hyman J., Pillarissetti A., Bailis R., Kumar P., Ruiz-Mercado I., & Rosenthal P. J. (2020). Everybody stacks: Lessons from household energy case studies to inform design principles for clean energy transitions. Energy Policy.

[36] Jewitt S., Atagher P., & Clifford M. (2020). "We cannot stop cooking": Stove stacking, seasonality and the risky practices of household cookstove transitions in Nigeria. Energy Research & Social Science.

- Housing arrangements that preclude the use of certain fuel types (Ochieng et al., 2020);
- Fuel availability and costs (Ochieng et al., 2020; Jewit et al., 2020);
- Technical problems with the distributed improved cookstoves – for instance, battery failure with gasifier stoves (Dickinson et al., 2019);
- Utilitarian and sociocultural factors, such as “wood smoke adds flavour to food and for food preservation”, perceptions such as “wood fuel cooks faster than any other fuel”, minimal preparation time for fuel used for three-stone fires, risk of burns and explosions when using liquefied petroleum gas (LPG), and seasonal weather patterns (Jewit et al., 2020, Dickinson et al., 2019).

Shankar et al., 2020 reviewed and synthesized stove stacking data gathered from 11 case studies of clean cooking programmes in low- and middle-income country settings, and showed that significant (28%–100%) stacking with traditional cooking methods was observed in all cases, as shown in table 12 below.

Table 12. Stove-stacking in different programmes

Country/Region	Clean fuel promoted	Stacking/stove use behaviour
Ghana	LPG	In rural areas, there is almost no sustained use of LPG: 100% of surveyed respondents still used wood as their primary fuel 9 months after LPG distribution; and only 8% still used any LPG 18 months post-distribution.
Peru	LPG	In rural areas, among households that used LPG stoves, 95% reported stacking with traditional biomass stoves; approximately 60% of cooking is done with LPG and 40% with biomass.
Ecuador	LPG	In a region where LPG has been heavily subsidized (Carchi district, Ecuador), 93% report LPG is primary fuel, but only 19% use LPG exclusively; 79% of households use wood at least once per week.
	Electric/ induction cooking	Despite the introduction of an induction cooking programme, sustained use of electricity for cooking is almost nonexistent in region studied.
Indonesia	LPG	Primary LPG users: Central Jakarta (73%), Yogyakarta (63%); exclusive LPG users: Central Java subdistricts (19.5%), Yogyakarta City (9%). There is some stacking with clean fuel (electricity), but 73% of stackers continue to use wood alongside LPG. The quantity of biomass use per month is similar in households with and without LPG.
Cameroon	LPG	In rural areas, 16% report primary LPG use but only 1% use it exclusively. In peri-urban populations, 58% report primary LPG use but only 10% use it exclusively. Thus, 90% of peri-urban and 99% of rural LPG-using households reported stacking LPG with biomass; stackers only obtain about 50% of the LPG per year that would support exclusive use.

Nigeria	Ethanol	In an urban population, four to five months after receiving CleanCook, 65% reported using it regularly. Of those, approximately 35% reported exclusive use, with the remainder stacking with kerosene. One-third also reported cooking with two stoves simultaneously primarily to save time. Fuel canisters were sold at an average rate of 2.3 canisters per household/month. This rate provides approximatively one-third of the estimated amount of fuel that a typical Lagos household requires to meet all of its cooking needs.
Ethiopia (Refugee camps)	Ethanol	Stacking varied across camps depending on foodstuffs. For some, CleanCook stove was well adapted to cooking; for others less so.
Ethiopia (Urban programme)	Ethanol	All surveyed respondents stacked, using between two and five stoves; 98% report using charcoal, 70% firewood, 6% kerosene, and 50% electricity in addition to ethanol.
Rwanda	Biomass pellets	In urban areas, 65% of cooking is done with traditional biomass fuels. Exclusive use of the clean technology is extremely rare.
China	Biomass pellets	In a rural population, 77% of homes continued to regularly use their traditional wood chimney stoves. Daily use of gasifier stoves was modest initially (40% of days in month) and declined over time.
East Africa (Kenya, Tanzania, Uganda)	Biogas	In rural areas (where nearly 93% of households rely primarily on wood or charcoal fuels), after biogas installation 46% report stacking in Kenya, 71% in Tanzania and 89% in Uganda.
Cambodia	Biogas	In rural areas, surveys found between 28% and 50% of adopters stacked with wood or charcoal. Measures of wood consumption in control versus intervention households show that biogas adoption reduces wood consumption between 54% and 78% but does not eliminate the use of wood fuel.

Source: based on synthesis study by Shankar et al., 2020

To address this issue of stove stacking, the methodology AMS-II.G. has already included requirements to monitor the parameter μ_y, which is an adjustment factor to account for any continued use of pre-project devices during the year *y*. See Data/Parameter table 12 of AMS-II.G. version 12, for details. According to the methodology, this parameter should be monitored using one of the following methods:

- If the pre-project devices are decommissioned and no longer used, as determined by the monitoring survey, its value is 1.0. If both the project devices and pre-project devices are used together, measurement campaigns shall be undertaken using data loggers, such as stove utilization monitors;
- Alternatively, surveys may be conducted if the use of data loggers to record the continued operation of baseline devices is demonstrated to not be practical – for example, when the baseline device is the three-stone fire.

An analysis was undertaken of the parameter values reported in monitoring reports of registered CDM project activities and PoAs. Table 13 below provides a summary of the results.

Table 13. Values reported to account for stove stacking

Parameter	No. of Monitoring Reports	Mean	SD	Mean – SD
Adjustment to account for any continued use of pre-project devices during the year *y*	44[(a)]	91.7	7.5	84.2

[(a)] A few outlier values were excluded for further analysis.

The following approaches are included in the revised methodology AMS-II.G. for an ambitious and conservative benchmark:

- If measurement campaigns are undertaken by activity participants using data loggers/sensors, such as stove utilization monitors, the value determined using the data loggers/sensors shall be applied.
- If end-user survey (e.g. questionnaire surveys) to determine the continued use of of the pre-project device (frequency and duration of usage) is undertaken, the results should be adjusted downward, i.e. if a survey according to CDM sampling guidelines is conducted to determine the extent of the usage of both the project devices and pre-project devices, the average minus one standard deviation value of the parameter μ_y determined using the questionnaire surveys shall be applied.

Data / Parameter table 13.

Data / Parameter:	$t_{y,i,j}$
Data unit:	Number of hours
Description:	Number of hours of utilization of the device during the year *y*
Source of data:	-
Measurement procedures (if any):	The rated capacity shall be based on the manufacturer specification. The number of utilization hours shall be estimated at least once every two years (annually or biennially). ~~The biennial survey shall follow a 95 per cent confidence interval and a 10 per cent margin of error in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities".~~ The sampling requirements indicated in section 5.2 and guidance provided in the "Standard for sampling and surveys for Article 6.4 activities and programme of activities" shall be followed.
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 14.

Data / Parameter:	$\eta_{new,i,j}$
Data unit:	Fraction
Description:	Efficiency of the device of each type *i and* batch *j* implemented as part of the activity
Source of data:	-

Measurement procedures (if any):	Activity devices with thermal efficiency less than 30 per cent are not eligible under this methodology. Efficiency shall be determined as follows: 1. The activity participants shall conduct a laboratory test of a sample of project cookstoves in accordance with ISO/TR 19867-1:2018 “Clean cookstoves and clean cooking solutions — Harmonized laboratory test protocols — Part 1: Standard test sequence for emissions and performance, safety and durability” or a comparable national standard and report the performance for thermal efficiency, emissions, safety and durability. 2. Where applicable, the activity participants shall meet the minimum conditions on the tiered performance targets set by the participating Parties. 3. The performance for efficiency and other parameters shall be based on certification by a national standards body or an appropriate certifying agent recognized by that body. 4. Manufacturer specifications may be used when the product has been tested as per the requirements above. 5. Sampling approach specified in the above ISO standard or national standard may be applied. Alternatively, the following simplified approach may be used, when the efficient cookstoves are produced by a manufacturer with a recognized management system in place (e.g. ISO certification) to ensure that the individual equipment produced do not vary beyond the range of acceptance limits (e.g. characteristics such as materials, critical dimensions): (i) Conduct a sample test on three cookstoves with three tests conducted for each stove. The test can be carried out by project proponents by themselves or stove manufacturers; (ii) If the standard deviation of the nine test results indicated above is very small and 90/10 precision requirement is met (in this case, the value of the t-distribution for 90 per cent confidence shall be used instead of Z value), the efficiency determined is acceptable, otherwise more sample tests would be required until 90/10 precision is met. 6. For project activities that implement cookstoves with saucepan capacities both greater than 30 L as well as smaller than 30 L, the most conservative value among the results of efficiency tests conducted (i.e. the least efficiency determined) on cookstoves of sizes equal to or smaller than 30 L may be used for stoves that are larger than 30 L in lieu of actual testing of the efficiency of stoves that are above 30 L capacity. The simplified approach above may also be used to comply with eligibility requirements under paragraph 0 and can be used only if the following conditions are met: (i) Stoves that can hold saucepans that are larger than 30 L are from the same manufacturer[37] and of similar design (e.g. with

[37] For in-situ constructed stoves, show that the prefabricated components are sourced from the same supplier.

	respect to construction materials including insulation material, placement of grate, cooking vessels and if applicable chimney) as compared to the stoves that are smaller than 30 L; (ii) Project proponents should demonstrate that comparable repair and maintenance practices are undertaken on all project stoves, irrespective of the size
Monitoring frequency:	(i) Recorded at the time of commissioning/distribution; (ii) Adjusted for the loss of efficiency as paragraph 44
QA/QC procedures:	-
Any comment:	Follow provisions in paragraph 44 to account for loss in efficiency of the activity devices

Data / Parameter table 15.

Data / Parameter:	$NCV_{biomass}$
Data unit:	TJ/tonne
Description:	Net calorific value of the non-renewable woody biomass, briquettes or charcoal used in activity devices
Source of data:	-
Measurement procedures (if any):	IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried' may be used if fuel used in project device is also woody biomass. If briquette is used as project fuel, NCV shall be measured annually
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 16.

Data / Parameter:	$SC_{new,i,j}$
Data unit:	tonnes of fuel/unit output or tonnes of fuel/hour
Description:	Specific fuel consumption or fuel consumption rate during year *y* of the device(s) of type *i* deployed as part of the project that is fuel consumption per quantity of item/s processed (e.g. food cooked) or fuel consumption per hour respectively with the age *a*
Source of data:	-

Measurement procedures (if any):	As per paragraph 40, using the controlled cooking test (CCT) procedure. The CCT shall be carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the CCT Protocol listed by Clean Cooking Alliance (See https://www.cleancookingalliance.org/technology-and-fuels/testing/protocols.html)). When the CCT is conducted on a sample basis, the sampling requirements indicated in section 5.2 and guidance provided in the “Standard for sampling and surveys for Article 6.4 activities and programme of activities” shall be followed
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 17.

Data / Parameter:	$f_{NRB,y}$
Data unit:	Fraction or %
Description:	Fraction of woody biomass saved by the project activity during year *y* that can be established as non-renewable biomass
Source of data:	-
Measurement procedures (if any):	As per TOOL30 If the calculated value surpasses 0.6, it should be limited to 0.6.
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	Applicable, only if project proponents opt for annual monitoring instead of fixing the value ex ante at the beginning of each crediting period

Rationale for changes

See the explanation provided in “Data / Parameter table 6.”

Data / Parameter table 18.

Data / Parameter:	$B_{y=1,new,i,j,survey}$
Data unit:	Tonnes
Description:	Quantity of woody biomass used by activity devices in tonnes per device of type *i*
Source of data:	Sample survey of end user or direct measurement at each end user locations

Measurement procedures (if any):	Determined in the first year of the introduction of the devices (e.g. during the first year of the crediting period, y=1) through measurement campaigns at representative households and/or sample survey. Sample surveys to estimate this parameter, that are solely based on questionnaires or interviews (i.e. that do not implement measurement campaigns) may only be used if the following conditions are satisfied: Pre-activity devices have been completely decommissioned and only efficient project device(s) are exclusively used in the project households; If multiple devices are used in the project, it is possible from the results of the survey questions to clearly differentiate the quantity of woody biomass being used by each device. In other words, if more than one device, or another device that consumes woody biomass, are in use in project households, then the sample survey needs to distinguish the quantity of biomass used by the project device and the other devices that use biomass
Monitoring frequency:	First year of installation
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 19.

Data / Parameter:	$B_{new,KPT,i,j}$
Data unit:	Tonnes/year
Description:	Annual quantity of woody biomass used in tonnes per project device of type *i*
Source of data:	Sample survey
Measurement procedures (if any):	Measured as per the KPT protocol. The KPT shall be carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the KPT Protocol listed by Clean Cooking Alliance (See https://www.cleancookingalliance.org/technology-and-fuels/testing/protocols.html)). The days selected for measurement of fuel consumption shall take into account seasonal/weekly variations in fuel consumption, or else the data from the measurement campaign shall be extrapolated in order to take into account the seasonal pattern
Monitoring frequency:	Annual monitoring of the quantity of woody biomass used in tonnes per project device of type *i* and batch *j*
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 20.

Data / Parameter:	**Life Span**
Data unit:	Number of years
Description:	The operating life time of the project device. The life span should be reported in cases where the PPs are opting to account the efficiency loss as per paragraph 44

Source of data:	Manufacturer (certified by a national standards body or an appropriate certifying agent recognized by that body)
Measurement procedures (if any):	-
Monitoring frequency:	Fixed and recorded at the time of commissioning/distribution
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 21.

Data / Parameter:	**Date of commissioning of batch *j***
Data unit:	Date
Description:	To establish the date of commissioning, the Activity Participant may opt to group the devices in “batches” and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch
Source of data:	Internal records
Measurement procedures (if any):	-
Monitoring frequency:	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch
QA/QC procedures:	-
Any comment:	To be reported in the monitoring report

Data / Parameter table 22.

Data / Parameter:	**Date of commissioning of project device *i***
Data unit:	Date
Description:	Actual date of commissioning of the project device
Source of data:	Internal records
Measurement procedures (if any):	-
Monitoring frequency:	Fixed and recorded at the time of commissioning/distribution
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 23.

Data / Parameter:	$N_{d,HH}$
Data unit:	Number
Description:	Number of activity devices distributed per household
Source of data:	Internal records
Measurement procedures (if any):	-
Monitoring frequency:	Recorded at the time of commissioning/distribution of activity devices

QA/QC procedures:	-
Any comment:	The results of ex post usage/monitoring survey should not be used to determine the value

Rationale for the changes

Using the data from sample of CDM projects from different geographic regions, the secretariat pilot tested the impact of the changes to the parameters to calculate the emission reduction per device The result of the analysis showed that the revised methodology results in conservative outcome as compared to the prevailing approach under the CDM, but the bigger chunk of the drop could be attributed to correct fNRB numbers (a correction than a change). Please refer to the following table for comparison between the two approaches. The column (c) shows the decrease in emission reducitons due to the change of the requiremetns for fNRB, and the column (e) shows the decrease in emission reductions due to the change of other parameters. The column (g) shows the net impact of all changes proposed in this document.

Table 14: Impact of changes to parameters on the emission reductions

Sr. No.	Country	**Emission reduction calculated using the CDM appraoch**	**Emission reduction calculated using the approach in this methodology**					
			Impact of requirements for fNRB		Impact of other changes to parameters		Net impact of all changes	
		(a)	(b)	(c) =1-(a)/(b)	(d)	(e) =1-(a)/(d)	(f)	(g) = 1 – (a)/(f)
		tCO2 /year /device	tCO2 /year /device	%	tCO2 /year /device	%	tCO2 /year /device	%
1	Uganda	2.64	1.93	27%	1.74	34%	1.27	52%
2	Lesotho	2.96	1.81	39%	2.53	15%	1.55	48%
3	Madagascar	2.73	1.69	38%	2.09	23%	1.30	52%
4	Nepal	1.43	1.06	26%	1.03	28%	0.76	46%
5	Nigeria	2.23	1.74	22%	1.78	20%	1.39	38%
6	Kenya	1.26	0.82	35%	0.74	41%	0.48	62%
7	Rwanda	5.22	3.20	39%	1.82	65%	1.11	79%
8	Ghana	3.72	2.26	39%	2.09	44%	1.27	66%
9	Uganda	3.48	2.29	34%	1.95	44%	1.28	63%

5.2. Representative sampling methods

57. A statistically valid sample of the locations where the devices are deployed, with consideration, in the sampling design, of occupancy and demographic differences can be used to determine parameter values used to calculate emission reductions, as per the relevant requirements for sampling in the *"*Standard for sampling and surveys for Article 6.4 activities and programmes of activities*"*. When biennial inspection is chosen, a 95 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampling parameter when using data sensors/loggers; and a 95 per cent confidence interval and a [x] [5] per cent margin of error shall be achieved for user-reported surveys. On the other hand, when the project proponent chooses to inspect annually, a 90 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampled

parameters when using data sensors/loggers; and a 95 per cent confidence interval and a [x] [5] per cent margin of error shall be achieved for user reported surveys.

Rationale for changes

Impact of moving to 95/d confidence/precision level

The table below shows the sample size, n, for confidence/precision level 95/d when estimating a proportion based on simple random sampling; population size = N; input proportion for sample size calculation = 0.5.

Table 15: Sample size according to different precision level (d) and population size (N)

n	d					
N	10	9	8	7	6	5
1000	278	322	376	440	517	607
2000	323	384	462	564	697	870
3000	341	410	501	622	788	1017
4000	351	425	523	656	843	1111
5000	357	434	536	678	880	1176
6000	362	440	546	694	907	1224
7000	365	445	553	706	927	1261
8000	367	448	559	715	942	1290
9000	369	451	563	722	955	1313
10000	370	453	567	728	965	1333

58. Efficiency of devices may be monitored in a common survey with other monitoring parameters; therefore, a random sub-sample within the common survey can be taken for which stove efficiency is tested, as long as the required precision for stove efficiency is achieved.

Appendix 1. Definition of regions

1. The table below lists the NA-I countries into six regions primarily based on the definition of “developing regions” used by the United Nations Development programme <http://hdr.undp.org/en/content/developing-regions> but with some modifications for the purpose of this methodology. This classification is for the limited purpose of determining a simple regional default value for fossil fuel emission factor (i.e. emission factor for the substitution of non-renewable woody biomass by similar consumers) for optional use by the project developers under equation 2 of this methodology.

Table 1. Classification for developing regions

Developing region	Countries
Middle East and North Africa	Algeria, Bahrain, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen, *Israel*
East Asia and the Pacific	Cambodia, China, Fiji, Indonesia, Kiribati, Democratic People's Republic of Korea, Lao People's Democratic Republic, Malaysia, Marshall Islands, Federated States of Micronesia, Mongolia, Myanmar, Nauru, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Viet Nam, *Cook Islands, Brunei Darussalam, Republic of Korea, Niue, Singapore*
Europe and Central Asia	Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Montenegro, Serbia, Tajikistan, The Republic of North Macedonia, Turkmenistan, Uzbekistan, *San Marino*
Latin America and the Caribbean	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Plurinational State of Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Bolivarian Republic of Venezuela
South Asia	Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, Maldives, Nepal, Pakistan, Sri Lanka
Sub-Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde,Cameroon, Central African Republic, Chad, Comoros, Congo, Democratic Republic of the Congo, Côte d'Ivoire, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, South Africa, Eswatini (Kingdom of), United Republic of Tanzania, Togo, Uganda, Zambia, Zimbabwe

Appendix 2. Non-binding survey questionnaire

1. Survey format A: Baseline fuel consumption pattern

1.1. General information[1]

Title of project activity/CPA/PoA	
Name of Surveyor	
Date of survey	mm/dd/yyyy
Period of measurements (for consumption rate)	mm/dd/yyyy to mm/dd/yyyy

1.2. Household profile[2]

Name (Household representative)	
Household size (total number of people)	
- Adult	
- Children	
Address	
Phone number (if available)	

1.3. Stove description prior to the project implementation[3]

(mark x with type of stove used)

"A three-stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. Without a grate or chimney".	
Any other type of stove	

1.4. Household fuel consumption pattern prior to the project implementation[4]

How many meals did you prepare last week or last month?	Meals/week or month

[1] Selection of households should be based on a sampling plan.

[2] If the survey is done biennially, it may be designed to capture the results for each year separately (e.g. the survey may ask for the utilization hours for year 1 and for year 2 separately).

[3] An "X" shall be filled in in one of the two alternatives. If the stove does not have a chimney or a grate, then "X" should be filled out for "Any other type of stoves". Such a stove would then be considered an improved cookstove.

[4] In many cases, the end-user might not be able to provide information on quantity of cooking fuel in terms units mentioned above. In many places the volume of firewood (e.g. the volume capacity and level of filling of the transporting/storage room) is measured, not its weight. This very much depends on the local practice of measurement. The activity participants should include such local measurement unit in the questionnaire. In some cases, the measurement unit could also be in terms of money spent on purchasing the fuel. Therefore, the activity participant shall provide further guidelines for how the conversion of these reported values to required units (mass or volume) should be carried out (e.g. If a household uses a bag of charcoal every 10 days, then the monthly average can be calculated if the weight (or volume and bulk density) of the full bag can be determined.).

1.4.1. Fuel use for cooking

	Yes/No	Quantity of usage	Unit
Charcoal			kg/month or year
Wood			kg/month or year
LPG			kg or Cylinders/month or year
Kerosene			Litres/month or year
Coal			kg/month or year
Electricity			kWh/month or year
Other fuels (explain)			

2. Survey format B: Project survey

2.1. General information[5]

Title of project activity/CPA/PoA	
Name of Surveyor	
Date of survey	mm/dd/yyyy
Period of measurements (for consumption rate)	mm/dd/yyyy to mm/dd/yyyy

2.2. Household profile

Name (Household representative)	
Household size (total number of people)	
- Adult	
- Children	
Address	
Phone number (if available)	

2.3. Household fuel consumption pattern post the project implementation

Cooking device	
Model name/number	
Unique ID	
Date of installation	mm/dd/yyyy
Do you use the project cookstove? (Physically check the stove).[6]	Yes/No
- If yes, have you used the stove regularly since you installed it?[7]	Yes/No
- If yes, is your stove in good condition?[8]	Yes/No
- If no, why did you stop using the stove?	

[5] Selection of households should be based on a sampling plan.

[6] The question is to determine if the cookstove is currently in use, i.e. to address the parameter of "usage factor". Physical checks to verify the usage may be done by checking the conditions of stoves, e.g. warm to touch, ashes in grate, and soot on stove.

[7] The question is to determine if the cookstove has been continuously used.

[8] The project proponent may rephrase the question keeping in mind the objective, i.e. whether or not the project cookstove is in usable condition. If the project cookstove is not in usable condition, the PP shall exclude such stoves from project database of the whole crediting year and subsequent years. The PP may include such stoves again on replacing them with new cookstoves of similar efficiency.

- How many meals did you prepare using project cookstove last week or last month?	Meals/week or month
Do you use your traditional (baseline) cookstove also?	Yes/No
- If yes, how many meals did you prepare using traditional (baseline) cookstove last week or last month?[9]	Meals/week or month
Do you use any other stove? (ICS etc.)[10]	Yes/No
If yes, list the types and number of other non-project stoves	
How many times a week do you use the non-project stoves?	
How much do you spend on fuel for cooking/type of cooking device in a week/month?	

2.3.1. Fuel use for cooking[11]

	Yes/No	Quantity of usage	Unit	Money spent on fuel/month/year
Charcoal			kg/month or year	
Wood			kg/month or year	
LPG			kg or Cylinders/month or year	
Kerosene			Litres/month or year	
Coal			kg/month or year	
Electricity			kWh/month or year	
Other fuels (explain)				

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[9] The question is to determine if the baseline stove is being used to account for activity emissions.

[10] The question is to cross-check if the project cookstove is used for all cooking requirements. It may also detect the situation where a household is taking part in more than one project activity, avoiding double-counting.

[11] In many cases, the end-user might not be able to provide information on quantity of cooking fuel in terms units mentioned above. In many places the volume of firewood (e.g. the volume capacity and level of filling of the transporting/storage room) is measured, not its weight. This very much depends on the local practice of measurement. The activity participants should include such local measurement unit in the questionnaire. In some cases, the measurement unit could also be in terms of money. Therefore, the activity participant shall provide further guidelines for how the conversion of these reported values to required units (mass or volume) should be carried out (e.g. If a household uses a bag of charcoal every 10 days, then the monthly average can be calculated if the weight (or volume and bulk density) of the full bag can be determined).

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