CLEAN DEVELOPMENT MECHANISM

CDM-MP94-A04

Information note

Stakeholder inputs on the review of clean cooking methodologies including estimation of fNRB values

Version 01.0

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. Clean development mechanism (CDM) has a high share of clean cookstove projects. The fraction of non-renewable biomass (fNRB), as opposed to what can be sustainably harvested, is one of the parameters that is a key determinant of the emission reduction estimates of the methodologies for clean cooking such as “AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass”.

2. The CDM Executive Board, at its 120th meeting, considered the information note on “Default values for fraction of non-renewable biomass” (fNRB), as contained in annex 7 to the MP 92 meeting report. The Board noted that many inputs were received from stakeholders in response to the call for public inputs on the information note and thanked stakeholders for the valuable inputs. The Board provided the following guidance to the secretariat and the MP regarding further work on the issues and requested the MP to make a recommendation to the Board on this matter at a future meeting:

    (a) Extend the call for stakeholder inputs until 31 January 2024;

    (b) Arrange a webinar for DNAs on the information note and seek feedback;

    (c) Refine the model and update the information note, taking into account the inputs received from DNAs, stakeholders and the feedback provided by the Board at this meeting;

    (d) Develop regionally disaggregated fNRB values for all countries where the use of low efficiency traditional cookstoves is currently observed;

    (e) Provide information on the uncertainty range of the estimates of fNRB values;

    (f) Continue to engage external experts to pursue the above work.

2. Purpose

3. The purpose of this document is two-fold:

    (a) To provide a compilation of public input received in response to the call for public inputs as below:

        (i) Call for public input on the “Info note: Default values for fraction of non-renewable biomass (fNRB)”, (open from 13 October to 10 November 2023);

        (ii) Call for public input on the “Info note: Default values for fraction of non-renewable biomass (fNRB)”, (extension of the period from 28 November 2023 until 31 January 2024);

    (b) To summarize and categorise the inputs received.

3. Key issues and proposed solutions

4. The Methodologies Panel (MP) sought inputs on the info note: Default values for fraction of non-renewable biomass (fNRB), as contained in MP 92 Annex 7. The work had been carried out in response to the mandate from the Board at its 116th meeting (EB 116 meeting report, para. 25), which requested the MP to develop subnational/regional values of fNRB, by building on scientific studies and engaging external experts.

5. Stakeholders were invited to provide their inputs on the approach adopted and proposal for improvement in the commenting table provided.

6. The MP thanked the stakeholders for providing comprehensive inputs on the topic. It reviewed each of the inputs provided and requested the external experts to provide an updated report taking into account comments provided.

7. This document does not include an update to the Info Note in Annex 7 of the MP 92 meeting report referred above. The MP at its 94th meeting thanked the external experts for the work done and provided guidance to them for further work to improve and clarify their inputs. The revised report from the external experts ("Updated fNRB Values for Wood fuel Interventions") will be published well before the 95th Meeting of the MP (tentatively scheduled from 30 September to 2 October) for a further round of inputs by the public. MP 95 will make a recommendation on the topic taking into account expert and public inputs for the consideration of 123rd Meeting of the CDM EB (tentatively scheduled for 6–8 November).

4. Subsequent work and timelines

8. Further work will be carried out as indicated in paragraph 4 above based on expert and public inputs.

5. Recommendations to the Board

9. MP 95 will make a final recommendation to the Board and will carry out further work based on the guidance from the Board.

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1. Current Work

1. A total of 50 responses were received as shown in Table 1.[1]

2. The secretariat paraphrased and grouped the information in the submissions to create a synthesis for better readability and overview. In this process, despite the best efforts, some relevant information may have been unintentionally omitted or not correctly represented. Additionally, it was challenging to fit certain information within the designated categories. Readers are encouraged to consult the original submissions (see footnote 1) to understand fully the background and context in which proposals are made in the submissions.

3. In-text citations in this document use acronyms (e.g., CE) to facilitate easy access to the original submissions.

Table 1. List of stakeholders who responded to the call for public input.

No.	Submitter	Stakeholder
1	Dee Lawrence	**Cool Effect (CE)**
2	Sassan Saatchi	**CTrees.org (CT)**
3	Advanced Carbon Asset Management Co. Ltd.	**Icebergchina (IC)**
4	Edi Medilanski	**Swiss Federal Office for the Environment (BAFU)**
5	Arnaud Dore	**Imperative Global (IG)**
6	Tristan Loffler	**MSCI Carbon Markets (MSCI)**
7	Matthew Leach and Samir Thapa	**MECS, Loughborough University UK (MECS)**
8	Tertius Murray	**Nova Institute NPC (NI)**
9	Lantonirina RATOVONJANAHARY	**DNA MADAGASCAR (DNAM)**
10	ONG Tandanavala	**Repetition, same as Submitter 9 (DNAM)**
11	Rajib Pramanik	**EKI Energy Services Limited (EKI)**
12	Mr. Astere Nindamutsa	**CDM-DNA Coordinator at Geographic Institute of Burundi (IGEBU)**
13	Aurélie Lepage	**AERA Group (AERA)**
14	Claver Ndizeye	**OBEN (OBEN)**
15	Johanna Depenthal	**Independent (JD)**
16	Pradeeti Tyagi	**BP Carbon Trading Limited (BP)**

[1] Details of the call for public input and the full submissions are available at: https://cdm.unfccc.int/public_inputs/2023/1310_01/index.html; https://cdm.unfccc.int/public_inputs/2024/1101_01/index.html

No.	Submitter	Stakeholder
17	Ramzy Kanaan	**Modern Cooking for Healthy Forests in Malawi (MCHF)**
18	Ramzy Kanaan	**Repetition, Same as Submitter 17 (MCHF)**
19	Erik Wurster	**BioLite (BL)**
20	Elisa Derby	**Clean Cooking Alliance (CCA)**
21	Jason Steele	**C-Quest Capital LLC (CQC)**
22	Annelise Gill-Wiehl	**University of California Berkeley (UCB)**
23	Esther Adams	**Proyecto Mirador LLC (PM)**
24	Richard H. Lawrence Jr.	**Repetition, Same as Submitter 23 (PM)**
25	Prof. Eliakimu Mnkondo Zahabu	**National Carbon Monitoring Centre, Tanzania (NCMC)**
26	Edwin Cogho	**TASC (TASC)**
27	Dawit Tibebu	**Ethiopian Clean Cooking Alliance (ECCA)**
28	ANNE NYATICHI OMAMBIA Ph.D.	**NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA KENYA) DNA_FOR CDM (NEMA)**
29	GEDIZ KAYA	**MUNDO VERDE CLIMATE (MVC)**
30	Catherine Mukobo	**ACERD asbl (ACE)**
31	David Kitt	**DelAgua Health Limited (DAH)**
32	Dr. Salisu Dahiru	**National Council on Climate Change (NCCC)**
33	Fundo de Energia – Mozambique	**Fundo de Energia – Mozambique (FEM)**
34	Javier Aristizábal	**Consultant (JA)**
35	Fundo de Energia – Mozambique	**Repetition, Same as Submitter 33 (FEM)**
36	Barbara Haya	**Berkeley Carbon Trading Project, UC Berkeley (UCB2)**
37	Princess Odiaka	**Nigeria Alliance for Clean Cookstoves (NACC)**
38	Christian Ehrat (Director VCS Methodologies)	**Verra (VE)**
39	Sven Kolmetz	**BURN Manufacturing Co. (BURN)**
40	Mercedes García Madero	**ALLCOT AG (ALC)**
41	ABHISHEK MAHAWAR	**KOKO NETWORKS LIMITED (KN)**
42	Anantha Karthik Rajagopalan	**UpEnergy Group (UEG)**

No.	Submitter	Stakeholder
43	Nathan P.M. Gachugi	**Repetition, Same as Submitter 39 (BURN)**
44	Mattias Ohlson	**Emerging Cooking Solutions (ECS)**
45	Lucas Belenky	**World Bank Group (WBG)**
46	Bob NATIFU	**MINISTRY OF WATER AND ENVIRONMENT (MWE)**
47	Thomas Finsterwald	**Foundation myclimate (FMC)**
48	C-Quest Capital	**C-Quest Capital (CQC2)**
49	Chris McKinney	**BURN Manufacturing (BURN2)**
50	Elizabeth Lopez	**Microsol (MCS)**

2. General Comments

4. Below is a summary of general comments received.

5. Insufficient time for robust review; Request for extension of deadline for submitting comments. (CE, CT, IGEBU, AERA, OBEN, JD, BL, PM, NCMC, TASC, ECCA, NEMA, ACE, DAH, NCCC, FEM, NACC, BURN, ALC, KN, UEG)

6. Current 30% default fNRB value is rarely used and too standardised. (MSCI).

7. The initiative to create more localised default values is much needed and a great step forward for improving project integrity. (MSCI)

8. Welcoming the mandate to develop subnational/regional default values of fNRB. (BAFU).

9. fNRB results are given for different time periods. This is potentially confusing, and more guidance is needed to their meaning. Suggest adding to the text explanation of results to give examples of appropriate use of the different time periods of fNRB results, e.g., as they relate to a carbon credit project that starts at x date and runs for y years. Another consideration could be to relate with the NDC updates – every five years. (MECS)

10. Appendix 2, Pg 34, 2nd para: The text says the method used leads to lower fNRB than TOOL30. It would be helpful to briefly explain the difference. Add brief explanation of how the method differs from that in TOOL30, resulting in lower fNRB values. (MECS)

11. Appendix 2, Pg 49: Inclusion of this section on proposed changes to TOOL30 is confusing: Is the purpose of the new work with MoFuSS not intended as a replacement for TOOL30? Clarify the purpose of this section on TOOL30 (e.g., perhaps if the MoFuSS work is not adopted, these are changes recommended to TOOL30?) (MECS).

12. We support and stand behind the current research and resulting updated fNRB values as published and recommend additional complementary work. (CCA)

13. The authors should include a discussion concerning the relevance and applicability of pixel-scale fNRB values. (CQ)

14. The report acknowledges that “MoFuSS relies on several dozen parameters to model land cover change associated with fuelwood harvesting.” Many of those parameters are in turn based on estimations and uncertain variables. With such a large number of assumptions, it is impossible to achieve precision. However, the fNRB figures in this report will be — and in some cases, already are being — regarded by ratings agencies, carbon buyers, and the media as factual, creating a real risk that carbon financed cookstove projects will lose their funding and cease to exist. The underlying assumption that precise fNRB figures are possible to determine has ultimately fed the narrative that carbon projects are universally bad. We ask that the CDM MP & EB clearly acknowledge the risk of inaccuracy in calculating fNRB using MoFuSS by adding the proposed verbiage. (PM)

15. The report mentions the use of pressure maps and the inverse distance weight (IDW) algorithm for distributing wood fuel demand and estimating fuelwood harvesting. For additional clarity, consider providing a brief explanation or reference for readers unfamiliar with the IDW algorithm. (MVC)

16. The report discusses the calculation of NRB at the pixel level and emphasizes that it does not account for the net decrease of AGB over the entire "wood fuel-shed." For better clarity, consider providing a brief explanation of what "wood fuel-shed" refers to in the context of the model. (MVC)

17. Paragraph 22 should consider the possibility to propose two options for calculating fNRB: option 1) keep equation 1 as per tool 30/version 04.0 and, option 2) use the new approach as proposed by information note (CDM-MP92-A07). (JA)

18. The Secretariat should provide some guidance (in a standard or tool document) on how an Activity Developer should identify the relevant “project area” within the context of their standalone activity/PoA as it is key to determining the right fNRB value. (VE)

19. It shall be noted by the EB that the decision to revise a baseline parameter taken in isolation, without reviewing all tenets of the methodology, may result in glaring omissions in the assessment. (KN)

20. The current methodology for fNRB assumes that the achievement of emission reduction is only dependent on the demand supply gap of renewable woody biomass. However, it ignores many other factors, like potential of the cooking technology to substitute the non-renewable woody biomass, which can still impact the projects ability to achieve the expected emission reductions. The proposed fNRB values will discourage investment in modern Tier 4 and Tier 5 clean cooking solutions and effectively create a preference of very low cost Tier 1-3 ICS solutions. (KN)

21. A training session would be more helpful for ease of adoption and utilization of the MoFuSS tool to enable the project developers to use their region-specific survey results to run the simulations and visualize the impact created by their emission reduction projects in their targeted geographical boundaries to in turn achieve the real usefulness of this scientific tool. Requesting UNFCCC and the lead researchers to organize a comprehensive workshop for the project developers to impart the technical know-how of the MoFuSS tool. (UEG)

22. Consider the inclusion of the carbon sequestration in the methodology, as the carbon stock increase is currently ignored. This could potentially mitigate the negative impact that the lower fNRB values will have on projects. (WBG)

3. TOOL30: Revisions, Clarifications and Proposed Changes

23. Below is the summary of public inputs received related to “Tool30”. (CQC, CQC2, UCB, UCB2, MVC, JA, VE)

24. It is noted that the assertion that TOOL30 lacks provisions for explicit spatial analyses is inaccurate. In practice, the tool allows for survey data to be used. Additionally, the claim that the tool recommends using outdated 2000 FAO tree cover data that overlooks trees outside of forests that are harvested for fuelwood is incorrect. The tool, in fact, offers multiple sources for tree cover data and mandates the use of the most recent data. Proposed Text: CDM TOOL30 mandates the use of the most recent available data, with a cutoff no earlier than the year 2000. The tool offers three primary options for sourcing tree cover data: the FAO Forest Resources Assessment, official statistics, and survey data. While the first two options lack spatial explicitness, the survey data option can include remote sensing surveys that allow for spatial analysis using tree cover data, such as the data published by Hansen. Hansen's data encompasses all tree cover regardless of land cover class, thereby including trees located outside of traditional forested areas. (CQC, CQC2)

25. The assertion that the tool lacks clear guidance regarding the choice of age-weighted growth rates for the IPCC's Refinement of the 2006 Guidelines for National Greenhouse Gas Inventories warrants consideration. The IPCC provides growth rates for trees both below and above 20 years of age, including those in primary forests. These age-weighted growth rates can exhibit significant differences, emphasizing the importance of selecting the appropriate growth rate. Proposed Text: It is possible to estimate the proportion of trees aging above and below 20 years, as well as the proportion representing primary forest, using the Hansen tree cover dataset. By utilizing the total tree cover, primary tree cover, and tree cover gain data, one can ascertain the percentage of trees falling within the younger and older than 20-year age categories. Subsequently, the appropriate age-weighted growth rate can be applied to each respective portion of the forest stand to which it corresponds. (CQC, CQC2)

26. The claim made by the Information Note (CDM-MP92-A07) that the CDM TOOL30 solely addresses accessibility by excluding protected areas from biomass supply consideration is inaccurate. The tool indeed encompasses and provides guidelines for defining geographically remote areas, considering factors like proximity to roads and rivers. This provision is explicitly stated on page 11 of CDM TOOL30 v4.0. Proposed Text: The CDM TOOL30 assesses accessibility by excluding biomass from protected and geographically remote areas within the total forest extent. To define geographically remote areas, DNAs/PPs may consider proximity to roads or rivers. For instance, areas of forests or other wooded lands located beyond the average distance typically travelled to collect fuelwood may be classified as non-accessible. This average travel distance can be derived from national studies, peer-reviewed literature, or surveys conducted within the project area. Accessibility encompasses all areas accessible to both forest industries and individual households. Consequently, the estimation of "non-accessible areas" should consider wood extraction by forest industries and fuelwood collection by individual households. (CQC, CQC2)

27. Eliminate the option for projects to continue to use even a revised TOOL30. (UCB, UCB2)

28. Briefly summarize the proposed changes to TOOL30, emphasizing the use of more recent land cover data and clearer guidance on age-based MAI values for biomass growth rates for improved reader understanding. (MVC)

29. Why should the way to calculate fNRB be changed? Certainly, it is not a matter to replace Tool 30 by another method or model, instead. The issue is using Tool 30 rightly. The new approach proposed by MP is intended to improve fNRB estimations in order to avoid overestimations of emissions reductions from mitigations projects to reduce unsustainable woody biomass use. However, conservative fNRB values can be obtained when equation 1 (Tool 30/version 04.0) is applied correctly. (JA)

30. Please clarify if the original version or a revised version of the TOOL30 will still be permitted as an alternative option to determine fNRB. (VE)

4. MoFuSS Model Characteristics

31. Below is the summary of public inputs received related to “MoFuSS Model (uncertainties and complexity)”. (CE, CT, EKI, BP, CQC, CQC2, TASC, MVC, ACE, NACC, BURN, ALC, VE, KN, UEG)

32. The entire model for fNRB is complex with a large number of variables, some of the variables rely on old data, or on variables built on a series of other assumptions, that it cannot provide a reliable estimate of non-renewability of the wood supply. (CE)

33. Determine how to manage the simulation allowing for differences in country consumption. (CE)

34. The MoFuSS tool is a complex GIS modelling tool that has been in varied forms of development since September, 2011. The tool and the assumptions that it draws upon are complex and its conclusions will have far-reaching implications on the crediting for cookstove carbon projects. (CT)

35. Page 23 of the information notes states “Therefore our simulations would be overestimating regrowth and underestimating fNRB”. How will this be justified? (IG).

36. The model does not account for changes in SOC and only addresses DOM indirectly. How can it be considered conservative, where harvesting leads to forest degradation or deforestation. The model must account for changes in SOC and DOM. (EKI)

37. Propose to have assumptions consistent with AMS-II.G or clarify the rationale for increased baseline stove efficiency. (BP)

38. Clarify what kind of result the assumptions with respect to charcoal to wood conversion factors create and how it compares with relevant literature. (BP)

39. The MoFuSS model is a complex system requiring numerous spatial inputs, each characterized by varying resolutions, each contributing its unique level of uncertainty. Further complexity arises from the need for resolution adjustments. The document should include a description of any required resolution adjustments and related assumptions. (CQC, CQC2)

40. Understanding the potential relationships among these inputs is crucial to minimize variations in estimations. Unfortunately, the report does not include an assessment of

collinearity among the input variables to determine their interdependencies. It is advisable to conduct a collinearity assessment of the input variables to ascertain potential relationships among them. This assessment can significantly aid to reduce variations in AGB, consumption, and fNRB estimates. The report should feature a dedicated section outlining the results, conclusions, and practical applications of the collinearity assessment. (CQC, CQC2)

41. Certain MoFuSS model inputs, such as population distribution and above-ground biomass (AGB), are derived from predicted data. Using estimated or projected data introduces notable disparities compared to the use of published data. The inherent uncertainties in the estimation model can lead to inaccuracies, potentially impacting fNRB estimation. In contrast, the utilization of published data helps mitigate these uncertainties. Assumptions regarding input data for future estimations can introduce uncertainties. For instance, assuming that rural and urban areas change only in size and not in spatial distribution over time or that the percentages of fuelwood users remain constant over time can affect future predictions of population and consumption patterns. (CQC, CQC2)

42. The model neglects to accurately account for forest degradation. Satellite images may show ground cover and attribute the same carbon sequestration value to this as in old growth forests; where this is clearly not the case. Extensive localized harvesting can have a significant impact on fNRB which is not accounted for in the model; whereby increasing the uncertainty of the calculations. Localized, project-base data can improve accuracy. (TASC)

43. It should be recognized that the inherent variability of fNRB is not represented by the model, and that project-level studies can increase the accuracy of the calculation. Therefore, there should be flexibility in the way that Project Developers can calculate project-specific fNRB rates that captures this variability more effectively using localized data on biomass fuel use and harvesting. (TASC)

44. The report provides an overview of MoFuSS's focus on above-ground biomass (AGB) but briefly mentions the lack of consideration for soil organic carbon (SOC). To enhance completeness, consider acknowledging the potential significance of SOC changes in the context of emissions reductions. (MVC)

45. The report mentions ongoing simulations for BaU and wood fuel savings scenarios for 2010-2050. For completeness, consider briefly explaining what the BaU scenario entails and its relevance to the study. (MVC)

46. The model neglects to accurately account for forest degradation. Satellite images may show ground cover but be unable to measure below-canopy degradation. Additionally, they may attribute the same carbon sequestration value to new growth as old growth forests, where this is clearly not the case. Extensive localized harvesting can have a significant impact on fNRB which is not accounted for in the model; whereby increasing the uncertainty of the calculations. (ACE, NACC, BURN, ALC)

47. The document should include a description of any required resolution adjustments and related assumptions. Additionally, it is advisable to conduct a collinearity assessment of the input variables to ascertain potential relationships among them. This assessment can significantly aid in reducing variations in AGB, consumption, and fNRB estimates. The report should feature a dedicated section outlining the results, conclusions, and practical

applications of the collinearity assessment. Furthermore, for inputs derived from estimations or predictions, a process of verification is essential. Descriptions of the verification methods and the resulting accuracy of the data should be included in the report. Moreover, it is important to establish justifiable assumptions regarding changes in population and consumption dynamics over time to improve the robustness of future predictions. (ACE, NACC, BURN, ALC)

48. We understand that the approach to determine fNRB default values is conservative. Can you clarify the following: (1) Does this approach include uncertainty deductions? (2) If so, do you have an estimate of the uncertainty of the default values, or how conservative they are? (VE)

49. Paragraph 9 of the document states that both WISDOM and MoFuSS models are based on the same basic concepts but with several key differences. However, there is extremely poor correlation between the results obtained from the two models (Fig 22). The reason for poor correlation between the two models is not discussed in the report. The use of updated values should not result in significant deviations unless there is a drastic landscape change in Sub-Saharan Africa during last few years. (KN)

50. This research adopts an approach which underestimates the biomass harvest (demand side) by assuming 0.40 tonnes/capita/annum and not accounting the woody biomass consumption of commercial sectors for both energy and non-energy applications. While on the other side, it adopts an aggressive estimation approach for the biomass growth functions and inflates the biomass availability (supply side). This approach appears to be unrealistic, failing to capture the actual supply – demand scenario. Although the emissions can occur in real-time, but the approach takes years to capture it. The identified inaccuracies in the MoFuSS model have resulted in lower fNRB values and thus undervalues the environmental and associated sustainable benefits that are achievable through high integrity community-based carbon projects and will have adverse implications on climate justice and finance for the host countries. (UEG)

5. MoFuSS Model: Improvements and Suggestions

51. Below is the summary of public inputs received related to “MoFuSS Model (improvements and suggestions)”. (CE, EKI, MSCI, MECS, JD, BL, CCA, CQC, CQC2, ACE, NACC, BURN, ALC, UEG)

52. Review “friction factor,” all protected areas are not equally difficult to access for both self-collection and commercial extraction. (CE)

53. The likelihood of wood harvesting within protected areas was considered only 10% that of unprotected areas with similar terrain, which is not the case in reality because of uncontrolled encroachment in protected area and has witnessed loss of tree cover throughout the last decade. Must use proper survey data to consider wood harvesting within protected areas. (EKI)

54. Include agricultural expansion wood fuel in the model as contributing to non-renewability. (CE)

55. Satellite Imagery: The use of geospatial techniques can help to validate the extent to which these projects slow and reduce the amount of deforestation and degradation

around the area by analysing carbon stocks and land use change in proximity to a project area. (MSCI)

56. Model scenarios for countries with reliable stove and fuel stacking data and compare the differences. If inclusion of stacking is shown to have significant effect, then the methodology adopted should allow project developers to include evidence on stacking in their project areas, and then adjust the fNRB by an appropriate factor. (MECS)

57. The modelling already estimates the population growth per pixel, so can the allocation as rural or urban be updated, e.g., if a pixel area passes the population density threshold to be classified as urban? (MECS)

58. More recent databases (in particular, the GEDI L4B Gridded Aboveground Biomass Density Database and the ESA's Climate Change Initiative Biomass project datasets) should be rigorously considered as alternatives to the WCMC 2010 base map and listed among potential databases on page 19. If an updated database is found to be suitable, the MoFuSS model should be re-run on the base of an updated AGB base map. (JD)

59. Model outputs should undergo a process of calibration and validation against real AGB estimates and patterns of deforestation, and adjustments made to the model as necessary. (JD)

60. In light of the influence of deforestation motivated by agricultural expansion or land on fNRB but the difficulties modelling these other sources of deforestation at the regional and global scale, we recommend that fNRB values be increased by an adjustment factor to compensate for this omission. (JD)

61. Does this model account for the anticipated expansion of road networks in the future? Road expansion is likely to significantly improve access to currently difficult-to-reach sites, reducing the friction values and resulting in higher rates of harvesting further from rural areas. (JD)

62. Comparing consumption and regrowth in a specific area may provide skewed results since regrowth may not take place in the area where consumption occurs. While there is an algorithm embedded in MoFuSS to account for transport of biomass, it isn't clear that the one size fits all approach is accurate. This explains why the default values for most African capitals are so far from what one would expect. The tool should have the ability to couple supply from one location with demand from another. (BL)

63. Stove stacking is exceedingly common in households cooking with biomass, especially in Africa. Not accounting for stove stacking, and only counting households that are primary wood and charcoal users leads to a significant underestimate of baseline fuel consumption. The reason cited was that such data is not available, however, making conservative assumptions rather than not counting any fuel use among households stacking does a disservice to host countries by artificially lowering fNRB values. (BL)

64. Biomass Growth Functions: We strongly recommend the researchers use the aboveground net biomass growth rates as defined by the IPCC's 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories specific to the respective age category of the forest types to determine rmax in order to apply a more realistic regrowth capacity. Also, the split of various forest age categories should be sourced from the relevant host countries and applied in the calculation. (BL)

65. Support the development of an online version of the model that project developers and other stakeholders can parameterize with their own locally specific data, to both enhance the accessibility of the model and potentially result in more accurate estimations. (CCA)

66. The report should incorporate a description of the calculation of the pressure index and the friction factor, along with an explanation of the relationship between these elements. Additionally, it is crucial to provide justification for the assumptions and methods employed in determining the friction factors. Furthermore, an assessment for validating and verifying the harvest function should be conducted, and the report should include a dedicated section addressing the accuracy and reliability of this function. This step will enhance the overall credibility of the model's results. (CQC, CQC2)

67. At present the computational power required for the MoFuSS model is too great to run the whole of Sub-Saharan Africa together. Instead, the numbers presented represent Sub-Saharan Africa run in four segments. This creates artificially high fNRB values in Rwanda and Burundi as the model is currently unable to account for cross-border trade with the DRC. We recommend the model is run with all Sub-Saharan Africa in one unit to properly account for cross-border trade. (ACE, NACC, BURN, ALC)

68. The tool and methodology should be designed to allow for the incorporation of alternative data sources. Input parameters should be made easily available for review. The model/ tool should have an assessment metric for tracking the effect of increasing or reducing the forecast period. (ACE, NACC, BURN, ALC)

69. Questionable sub-national fNRB Values: This research work has reported lower fNRB for some of the Urban centres like Kampala, which is unrealistic. This might be due to better connectivity assumptions made in the model to the capital cities of the country. But alarmingly low value doesn't mean there is no need to do any interventions, we see urbanization rate is very high in Africa and the model will have to consider reducing accessibility assumptions. (UEG)

70. It's important that the provision of updated default values is not separate from any other methodological updates and guidance for projects that don't want to just use these default values. Ensuring that the model is an open one, and updated methodologies align with this approach is important. Some of the standardised inputs (eg around consumption per capita) could create inaccuracies at the local level, and therefore projects may not want to use the default values. However, in this case, it is critical that any updated cookstove or relevant methodologies align with this same modelling approach, then projects can still use their own inputs regarding consumption per capita where justified and robustly evidenced, and have some consistency to the default values. (MSCI)

6. Account for Non-Residential Wood Fuel Demand

71. Below is the summary of public inputs received related to "non-residential wood fuel demand." (CE, IG, EKI, JD, BL, CCA, CQC, CQC2, ACE, NACC, BURN, ALC, VE, KN, WBG, UEG)

72. The model focuses primarily on residential wood fuel demand and does not count wood harvesting for any other purpose. (CE)

73. Strongly recommend to account for wood fuel use in commercial and industrial activities especially for South Asian countries. (IG)

74. Wood consumed by formal and cottage industries as well as commercial establishments shall be considered. (EKI)

75. Incorporate commercial fuelwood use and/or change the language referring to commercial fuelwood use throughout to eliminate ambiguity. (JD)

76. The model focuses primarily on residential wood fuel demand and does not count wood harvesting for any other purpose. There is substantial use of wood fuel for other purposes (lumber including waste, brick kilns, industrial uses, etc.) and to ignore this aspect of consumption is inaccurate. If primary data is lacking, including conservative assumptions is much better than ignoring the source of consumption entirely. (BL)

77. Refine this work by commissioning and integrating complementary site-specific data into the global model for key geographies with special wood fuel supply and demand considerations, (e.g. brick-making and lumber). (CCA)

78. Regarding the estimated current and projected demand for wood fuel, the model has basically focused only on residential wood fuel demand. It is stated that other sources of demand have not been included for several reasons, including (i) no reliable data on other activities, such as brickmaking, fish smoking and beer brewing and (ii) industrial roundwood ("renewable") accounts for less than 10% of the overall wood harvest. However, activities, such as brickmaking and tobacco curing, but also fish smoking and beer brewing represent substantial deforestation and degradation drivers in SSA and there is reliable data to estimate the deforestation impacts of several of these sources, as illustrated below (either direct data or in combination with other trends such as consumption of products per capita and populational growth). (CQC, CQC2)

79. The model can be modified to include alternative sources of demand. (ACE, NACC, BURN, ALC)

80. The secretariat may consider including a conservative default factor (possibly, the lowest fraction of total wood harvest in non-SSA countries) to account for the demand for wood from formal/cottage industries and commercial establishments in such non-SSA countries. (VE)

81. The rationale provided for exclusion of non-residential demand is the low contribution of industrial roundwood production to the overall wood harvest in many sub-Saharan African countries. However, this rationale should not serve as a basis for exclusion, as Tool 30 encourages a bottom-up approach that is adaptable to diverse regional and national contexts. The proportion of non-residential wood-fuel use can vary significantly by region, making it essential to account for these variations in fNRB calculations. (KN).

82. We recommend researchers to include the woody biomass consumption (for both energy and non-energy application) of non-residential sectors as well based on the reliable sources such as UN, FAO for a realistic estimation of biomass harvest in line with CDM tool 30. (UEG)

83. Suggest the methodology team for the report to revisit the assumptions and model to include non-residential wood fuel demand to the extent possible. (WBG)

7. Wood fuel Consumption Data

84. Below is the summary of public inputs received related to “wood fuel consumption data”. (IG, MECS, NI, IGEBU, AERA, OBEN, ACE, NACC, BURN, ALC, JD, BL, CQC, CQC2, PM, NCMC, ECCA, NEMA, NCCC, FEM, TASC, VE, KN, UEG, ECS)

85. Reconsider the wood fuel consumption per person per year. Also, allow Project Developer to use baseline KPT value in fNRB estimation instead of default wood fuel consumption. (IG)

86. Model scenarios to look at the effect of varying the consumption values, e.g., by rural/urban, and by regions, to see the effect of the differentiation in consumption values used to generate fNRB. If such differentiation in consumption values is shown to have significant effect, then the methodology adopted should allow project developers use specific values in their project areas, and then adjust the fNRB by an appropriate factor. (MECS)

87. Data availability for non-primary wood fuel use might be an issue in most countries. For now, add a description of the limitation and make provision in the model for an adjustment factor where data on wood fuel, as a secondary energy carrier, is available. (NI.)

88. The model only includes households that use wood fuel as their primary energy carrier for cooking and might therefore underestimate the demand for wood fuel by excluding secondary wood use. (NI).

89. Must use proper survey data to consider wood harvesting within protected areas. (EKI)

90. The CDM MP shall consult directly with Host Counties on the estimation of demographic and wood fuel consumption data, forestry data and charcoal supply chain data. The quantification of demographic and wood fuel consumption data can be sourced from updated Host Country approved DHS or Census data. (IGEBU, AERA, OBEN, ACE, NACC, BURN, ALC)

91. Add a table or appendix with more specific information on the data sources, assumptions, and limitations for variables contributing to estimates of fuelwood demand, similar to the example of Table 1 in the Ghilardi et al (2016). (JD)

92. We strongly recommend the researchers use to most appropriative country-specific wood fuel consumption values based on any official statistics or UN data or through localized surveys etc. (BL)

93. Instead of applying the default value, it is advisable to utilize the country-specific data derived from household surveys and PDDs for calculating consumption. Furthermore, for each country, it is essential to ascertain the contribution of commercial wood production and the portion that is sustainably supplied before considering its removal from the analysis. This approach ensures a more accurate reflection of consumption patterns. (CQC, CQC2)

94. The CDM MP shall consult directly with Host Counties on the estimation of demographic and wood fuel consumption data, forestry data and charcoal supply chain data. The quantification of demographic and wood fuel consumption data can be sourced from

updated Host Country approved DHS or Census data. (PM, NCMC, ECCA, NEMA, NCCC, FEM)

95. Accessibility is not accurately modelled in the new values. Allow for variable accessibility rates dependent on project-specific conditions. Adjust calculations for fuel types; e.g. charcoal vs. wood. Proposed text: Neither approach adequately makes a localized assessment of where biomass for different fuel types is sourced. Rural villages using wood fuel are more likely to source the nearest available fuel in an unmanaged way; leading to high levels of localized fNRB. Whereas, biomass for charcoal may be sourced from an entirely different region and, quite frequently in Africa, from across international borders. It is very difficult to see how a 'unified' fNRB is applicable for al fuel types in one particular region. (TASC)

96. Project developers should be allowed to employ project data to inform the fNRB calculations for their project area. Baseline assessments of fuel use can be utilized in the calculations to improve accuracy. The model does not account for localized collection and use of biomass which can be inherently unsustainable. Project developers can assess during the baseline stage the accessibility of biomass and how biomass is harvested to improve accuracy of the fNRB in harvested biomass. This can be based on assessments of how far households must travel to collect wood fuel, for example. (TASC)

97. It is proposed that the authors of the study and the UNFCCC re-do the calculations using more appropriate consumption values as derived through KPTs or other similar field performance tests used to determine baseline wood consumption. There are numerous project developers who on the regular conduct baseline KPT's throughout the areas considered in the study. This data is also available to the public as PD's are required to share information such as this in the public domain through the respective carbon registries. (TASC)

98. Guidance shall be provided to developers on how to incorporate variability in annual consumption of woody biomass per person. (ACE, NACC, BURN, ALC)

99. Guidance shall be provided to developers on how to incorporate wood fuel from agricultural areas in the non-renewability category. (ACE, NACC, BURN, ALC)

100. Review "friction factor," all protected areas are not equally difficult to access for both self collection and commercial extraction. (ACE, NACC, BURN, ALC)

101. The Secretariat may consider using a range of friction values (rather than keeping a single, fixed value) which would be dependent upon several inherent factors like safety/rule of law, human development, economic growth etc. Please refer to Dehmel et al. (2022) and the Ibrahim Index of African Governance (IIAG). (VE)

102. The methodology applying fNRB values should also develop a tool to assess the project's ability in displacement of non-renewable biomass within the project area. The projects, which are not able to objectively justify impact on the supply of non-renewable woody biomass, shall not be allowed to apply new fNRB values. (KN)

103. We strongly recommend the researchers use to most appropriative country specific wood fuel consumption values based on any official statistics or UN data or through localised surveys etc. (UEG)

104. The study should consider the specific consumption values for wood and charcoal fuels separately and the efficiency loss in charcoal conversions needs to be factored while estimating the biomass demand. If the MoFuSS model already accounts for the charcoal conversion losses, then the conversion efficiency considered needs to be explicitly mentioned in the information note. (UEG)

105. To accurately account for the true effects, perhaps two different values of fNRB would be needed, for firewood and charcoal respectively, or a conversion factor. (ECS)

8. Biomass Stock and Growth Functions

106. Below is the summary of public inputs received related to “biomass stock and growth functions”. (CQC, CQC2, MVC, ACE, NACC, BURN, ALC, UEG)

107. A validation and verification assessment of the 2010 baseline AGB maps sourced from WCMC should be carried out. The report should incorporate a dedicated section discussing the accuracy of these AGB maps. Furthermore, it is essential to provide information on the model accuracy employed in predicting future AGB values in the report. This will enhance the transparency and reliability of the fNRB assessments. (CQC, CQC2)

108. The previously mentioned assessment for validating and verifying the AGB maps is crucial not only for the AGB but also for the accurate estimation of maximum AGB stock. Moreover, utilizing total, primary, and tree cover gain data to estimate the portion of stand aged below and above 20 years and applying the corresponding growth rate values for different stand ages can enhance the accuracy of growth estimations. It is imperative to conduct an assessment for validating and verifying the growth function, and the report should encompass a dedicated section addressing the accuracy of this function. This will bolster the reliability of the entire estimation process. (CQC, CQC2)

109. The report mentions potential overestimation of regrowth and underestimation of fNRB in regions not affected by future tree loss. To enhance transparency, consider briefly addressing how the model accounts for these factors and any adjustments made to mitigate potential biases. (MVC)

110. The report explores the sensitivity of MoFuSS fNRB results to input parameters, including maximum AGB stocks (K) and growth rates (rmax). For completeness, consider providing a brief explanation or reference for readers unfamiliar with the terms "maximum AGB stocks" and "growth rates (rmax)." (MVC)

111. The dataset identified indicates above-ground and below-ground biomass. It should be made clear whether the growth curves and maximum values are based on total above-ground biomass or woody above-ground biomass. The former may lead to some overestimation in grassland ecosystems. If this is already considered, then this needs to be made clearer. (ACE, NACC, BURN, ALC)

112. A validation and verification assessment of the 2010 baseline AGB maps sourced from WCMC should be carried out. The report should incorporate a dedicated section discussing the accuracy of these AGB maps. Furthermore, it is essential to provide information on the model accuracy employed in predicting future AGB values in the report. This will enhance the transparency and reliability of the fNRB assessments. (ACE, NACC, BURN, ALC)

113. We would strongly recommend the researchers use the aboveground net biomass growth rates as defined by the IPCC's 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories specific to the respective age category of the forest types to determine and to assume the rmax based on the scientific research works to calculate the realistic growth function of the biomass. Also, the split of various forest age categories to be sourced from the host countries and applied in the calculation. (UEG)

9. Location-tailored fNRB Values and Demand Scenarios

114. Below is the summary of public inputs received related to "location-tailored fNRB values and demand scenarios". (IC, MSCI, DNAM, EKI, BP, MCHF, ACE, NACC, BURN, ALC, JA, KN, WBG, MWE)

115. Using a globally uniform fNRB default value, or at least a regionally uniform fNRB default value, like the regional default values of $EFprojected\_fossil\ fuel$ in Table 2 of CDM Methodology AMS-I.E. (IC)

116. We have spoken to others in the market before about not just providing default values, but providing ranged guidance (e.g. upper bounds that can be used). There is clearly going to be local variations even within the pixel approach, but having guidance on what the realistic bound of these variations could be. For example, if the default value for a locality is 45%, how realistic is it for this to reach 80% within very small communities within the locality? (MSCI)

117. We wish to raise concern about the inaccuracy of the proposed fNRB (2020-2030) value of 22% for Madagascar. Country-level default fNRB values are not necessarily the most accurate measure of deforestation as forest distribution is not uniform across all regions within a country. Localised values should be used to determine accurate fNRB values for the unevenly forested nation of Madagascar. (DNAM)

118. The fNRB assessment for other regions appears to lack relevance, as it acknowledges that limitations in time and resources led to the calculation of values using a single pressure map based on 2010 demand, rather than employing annually updated maps and conducting multiple Monte Carlo simulations. This approach renders the calculated values unreliable and, therefore, they should not be included in the final report. Such inclusion could convey a negative message to potential investors, potentially discouraging their interest in supporting community projects such as cook stoves and water filters. fNRB assessment for other regions shall be removed from the final document. (EKI)

119. Provide default values at the second administrative level for all countries assessed as opposed to only DRC and Mauritania. (BP)

120. Calculate the default values for all countries and expand geographic reach of this study to generate reliable fNRB estimates and bolster implementation of carbon project activities. (BP)

121. Ineffective and indiscriminate targeting of interventions (missing the mark on deforestation and degradation): The evidence (data/analyses) from Malawi is clear—charcoal production and consumption are far more impactful on Malawi's forested landscapes than firewood harvesting (both in terms of the impact in real-time, and the

cascading impacts over time). However, by virtue of having an aggregate fNRB (as opposed to wood fuel specific fNRBs) the methodology essentially results in an "average" fNRB across wood fuels (and other wood uses) that over-estimates the fNRB for firewood (i.e. makes firewood harvest appear less sustainable than it actually is) and under-estimates the fNRB for charcoal (i.e. makes charcoal appear more sustainable than it actually is). (MCHF)

122. The single, "averaged" fNRB result (across any area/jurisdiction) greatly reduces the rationale/financial incentive to focus on more expensive (but more impactful) cleaner/clean cooking solutions. As a result of the concerns described above, I strongly suggest that fNRB default values either: 1. fully disaggregate between firewood and charcoal to ensure that the proper incentives are in place for project developers to invest in the most impactful cleaner cooking technologies; or, 2. develop a way for the model/output to recognize the extent to which a given wood fuel use, within a specified jurisdiction is non-renewable. (MCHF)

123. I would suggest having default fNRB values at only one administrative level – presumably the lowest level that can be modelled with confidence – to avoid the incentive for developers to pick and choose the most advantageous administrative level. (MCHF)

124. The CDM EB is requested to provide guidance on a mechanism to allow for variable accessibility rates dependent on project-specific conditions and adjust calculations for different fuel types; e.g. charcoal vs. wood. In particular, we seek guidance on how sub-national fNRB numbers can be applied to charcoal projects, given charcoal is sourced remotely from the location of households / project interventions. (ACE, NACC, BURN, ALC)

125. Certainly, fNRB values vary across different geographical scales, so precaution must be taken of applying national based fNRB to others subnational analysis units. In the Colombian case, national fNRB delivered a negative figure (it means, biomass 100% renewable by far) which is owing to more than 52% of country´s area is forested, so fNRB assessment should be carried out on a subnational basis in order to be aware of those regional features which could affect fNRB. (JA)

126. The critical importance of harmonizing fNRB values with the local supply scenarios and actual observations on the ground. Similar issues at both national and sub-regional levels are observed in other countries. (KN)

127. The methodology used for the projection of demand (as described in paragraph 16) lacks the same rigor as applied for supply projections. It applies a very simplistic approach of primary user multiplied by the average consumption which does not take into account many factors like the secondary fuel consumption which is prevalent in African countries. (KN)

128. fNRB value, apart from enabling precise measurement of emission reductions, is also instrumental in driving the policy initiatives and secure climate financing for a country. An fNRB value purely based on the demand & supply of woody biomass can create perverse incentives for the Government to promote deforestation and inflate demand for fuelwood as it would drive higher fNRB value for the country. (KN)

129. Suggest allowing host countries to propose their own default values for projects to use. (WBG)

130. The current study conducted by UNFCCC has calculated the country level fNRB for Uganda as 38% - this indicates only 38% of the biomass consumed in Uganda is non-renewable and the rest 62% biomass is being sustainably produced. The revised fNRB values (as per this study), undervalues the climate impacts of high-integrity cookstove projects that are currently active in Sub-Saharan Africa, and will have adverse implications on climate justice and finance for the host countries. (MWE)

10. Review, Validation & Verification Processes

131. Below is the summary of public inputs received related to “review, validation & verification processes”. (CE, IC, IG, BP, CQC, CQC2, ACE, NACC, BURN, ALC, FMC, MCS)

132. Request a review of alternative discount factors that can be applied to cookstove project credits that provide a straightforward means to ensure projects are not over-crediting or a Tool with which projects can perform independent calculations. Perhaps Household reliance on biomass consumption for energy needs can be considered as a default factor. Perhaps a risk evaluation similar to a buffer pool review, can be performed and audited to determine the non-renewability of the fuel. This could include reachability of wood source, country rate of deforestation/degradation, time spent gathering fuel, trends in wood prices, type of biomass collected and used, etc. (CE)

133. More review on the fNRB value to prevent defying common sense where electric stoves appear more harmful than firewood cookstoves. (IC)

134. Is there any validation and verification process for the estimated fNRB values? Will these values also be validated and verified by some external agency / consultant apart from UN Meth Panel? (IG)

135. Define stakeholder and/or institution who would be generating the maps/values for new geographies no covered in the study commission by the Board and who would be responsible for updating these maps/values for all geographies over time. (BP)

136. For inputs derived from estimations or predictions, a process of verification is essential. Descriptions of the verification methods and the resulting accuracy of the data should be included in the report. Moreover, it is important to establish justifiable assumptions regarding changes in population and consumption dynamics over time to improve the robustness of future predictions. (CQC, CQC2)

137. Even though we understand the model is a result of multiple parameters and input data, we would strongly suggest that a general cross check of references regarding deforestation, population, and urbanization trends, as well as fuelwood projections in SSA be performed against the overall modelled results, since several sources indicate trends that often contradict stable or decreasing fNRB modest rates presented. Such a general cross check would go beyond the specific technical parameters we referred to in the previous documents since a broader cross check is likely to address qualitative analysis and literature review at the aggregate level. (CQC, CQC2)

138. It is imperative to conduct an assessment for validating and verifying the growth function, and the report should encompass a dedicated section addressing the accuracy of this function. This will bolster the reliability of the entire estimation process. (ACE, NACC, BURN, ALC)

139. The report should incorporate a description of the calculation of the pressure index and the friction factor, along with an explanation of the relationship between these elements. Additionally, it is crucial to provide justification for the assumptions and methods employed in determining the friction factors. Furthermore, an assessment for validating and verifying the harvest function should be conducted, and the report should include a dedicated section addressing the accuracy and reliability of this function. This step will enhance the overall credibility of the model's results. (ACE, NACC, BURN, ALC)

140. If the fNRB can be defined or at least adapted on a project-specific basis in a future version of the methodology (as in the current CDM Tool 30), we would welcome clearer and stricter controls in validation and verification by the DOE and by the standard so that this value is also checked uniformly. We do not consider this to have been the case in the past which lead to great inconsistencies. (FMC)

141. Utilize field-collected data to enhance the precision of the results. This aspect can be appropriately considered during the validation phase or project renewal. (MCS)

11. Transition Timelines, Validity Period and Updation Process

142. Below is the summary of public inputs received related to “transition timelines, validity period and updation process”. (BAFU, IG, MSCI, BP, UCB, UCB2, WBG, FMC)

143. The Section called “Subsequent work and timeline” does not have estimated timeline for the completion of the mandate. Add a tentative timeline, possibly with milestones, to complete the mandate. (BAFU)

144. Confirm the validity of the fNRB values. What will be the validity period of these fNRB values, once approved and come into force. (IG)

145. Is there any tentative timeline when the fNRB value for the remaining countries/regions will be available for Project Developer? (IG)

146. Updating Process: From experience with other project types in the carbon markets, it is critical that there is a process in place to ensure these values are regularly updated as we have seen many occasions of default values becoming quickly outdated. Underlying data inputs can change materially in short periods of time, and the default values should be set up with a clear procedure for when / how they will updated. (MSCI)

147. Define a plan and timeframe/frequency for updating and revising the default data. (BP)

148. Adopt (and thus force projects to adopt) the newly released values for fraction of non-renewable biomass (fNRB) for Article 6.4. (UCB, UCB2)

149. Require updated fNRB values each monitoring period to align with current science. (UCB, UCB2)

150. A transition system might be proposed to align projects with the new values over time. (WBG)

151. There should be clear guidance which fNRB value should be used for crediting periods that fall into two different 10-year periods. (WBG)

151. We need a strong guidance and a clear line and communication from CDM and GS (and other certification entities) necessary on how to proceed with existing projects as soon as possible as any project development in the current situation is highly challenging. We request a clear guidance on how any updated values are to be used, i.e. if an immediate or progressive implementation of the new values is foreseen. We request a clearly defined schedule on how the values will be updated in the future to enable more long-term planning stability in our projects. The procedure to apply any new values should be as simple as possible while still being conservative and robust and enable uniform handling among project developers and project implementers. (FMC)

Appendix 1. Extracts of key recommendations received from stakeholders

1. Refer to the Excel file that is published separately with this annex.

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Document information

Version	*Date*	*Description*
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