Template for comments

Date: 08 Aug 2024	Document: Proposal for improvement - Updated fNRB Values

TABLE FOR COMMENTS

Name of submitter: Anantha Karthik Rajagopalan

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0	1	2	3	4	5	6
#	**Para No./ Annex / Figure / Table**	**Line Number**	**Type of comment** **ge** = general **te** = technical **ed** = editorial	**Comment (including justification for change)**	**Proposed change (including proposed text)**	**Assessment of comment** ***(to be completed by UNFCCC secretariat)***
1	**-**	**-**	**ge**	**General acknowledgement** We sincerely thank Adrian Ghilardi, Rob Bailis & the whole research team for patiently addressing all of the stakeholder's comments and incorporating the suggestions in the MoFUSS model. The updated version of the study report explains the data sources, calculations methodologies and assumptions made in a good detail. Especially the Appendix 3 clearly addresses majority of PD's queries.	We understand that the MoFUSS developers are working on a cloud-based version of MoFuSS that will allow PDs to develop their own models using the respective country and project specific inputs. UpEnergy Group would request the researcher's team to throw some visibility on the timeline by MoFUSS cloud version will be open for public. 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.	

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2	**-**	**-**	**ge**	**Extension of Public Commenting Period** The information note has been published on 20 June 2024 and the stakeholders are allowed to share the views and feedback on the note and the related research work till 09 August 2024. We strongly feel that this timeline is inadequate to review, comprehend, analyse and opine, considering the huge efforts and information which has gone into to the exhaustive research work.	We would recommend to extend the timeline for the stakeholder consultation process to enable participation of boarder audience including Project Developers, National Designated Agencies (NDAs) and Governmental bodies from Host Counties, Academicians, NGOs etc. Proposed text: *"With the widespread request from the stakeholders, the committee will extend the deadline for commenting on updated fNRB information note from 09 August 2024 to 15 September 2024"*	

3 | **Page No – 6 to 7 Para No – 23 to 28 & Appendix 2** | **Whole section** | **Te**

Biomass Stocks

This research work has used NASA information to source Global Aboveground and Belowground Biomass, which dates back to 2010 with coarse resolution. The justification given by the research team is to begin the simulations from 10 years back in time and to calibrate the model based on the changes that has occurred. In contradiction to this statement in Appendix 2 para # 37 quotes that the validation exercise is not part of this research work as UNFCCC has not provided the budget and time for carrying out validation exercise.

We have the following questions to the research team and UNFCCC,

A) Queries to the Research team

1) As a matter a fact, there is significant loss in the forest cover due to unsustainable harvesting and deforestation of wood fuels predominantly in SSA regions in the last decade. To highlight few the below table encompasses the total forest cover of 2010 and 2020 for select SSA countries,

#	Country	Total Forest Cover (1000 ha)[1]			
		2010	2020	Abs. Loss	% loss
1	Uganda	2,750	2,338	413	15.0%
2	Tanzania	49,950	45,745	4,205	8.4%
3	Nigeria	23,260	21,627	1,633	7.0%
4	Zambia	46,696	44,814	1,882	4.0%
5	Malawi	2,662	2,242	420	15.8%
6	DRC	137,169	126,155	11,014	8.0%
7	Mozambique	38,972	36,744	2,228	5.7%
8	Ethiopia	17,799	17,069	730	4.1%
9	Niger	1,204	1,080	124	10.3%
10	Somalia	6,748	5,980	768	11.4%

Data Source: Food and Agriculture Organization of the United Nation, 2020

2) It is evident from the above data biomass stocks available in 2020 will substantially differ from 2010, therefore the resulted fNRB values from the MoFUSS study considering 2010 biomass stocks will have highest degree of uncertainty unless proven otherwise through calibrations of model to track the changes occurred in the past. If not, this would inflate the biomass supply side and adversely affects the NRB fraction.

3) Also as stated in the Appendix 2 the MoFUSS simulation has turned off deforestation submodule, hence there is higher possibility for inaccuracies considering forest cover change that has been witnessed in the last decade and future population growth, increased wood fuel demand, urbanization and development activity etc.

We strongly recommend the researchers to use the most recent biomass stock maps from sources like Orb5 with high or medium resolution (30 m) or alternatively if the NASA vintage maps is still used, we recommend a validation process to have credible results. UNFCCC shall ensure the model is fully calibrated to garner wide acceptability from the carbon / scientific community.

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				B) Queries to the UNFCCC The fNRB values resulted from the MoFUSS research will be widely accepted by the carbon PDs, host country NDA, Registries, Rating agencies and other international stakeholders only when the MoFUSS model proven reliable through calibrations of obtained results with forest cover changes occurred in the past time period. From the Appendix 2 para # 37, we understand the capacity and willingness from the research team for conducting such validation activities, however differing the same for want of budget and timelines is not seeming to be rational. Hence to get the wide acceptability of the MoFUSS model by the scientific communities a calibration activity is much essential.		
4	**Appendix 2. Page No – 32 Para No - 22**		**Te**	**Biomass Growth Functions** The research team has responded to our earlier comment on “Biomass Growth Functions” and considerations of r_{max} value as growth rate of Secondary Forest ≤ 20 years. The research team conveys gathering of forest age categories from the host countries will not be a viable option. Also, an explanation has been given that even though the rmax value has been considered growth rate as of for Secondary Forest >20 years, since the model accounts for growth rate for Primary Forest and Secondary Forest >20 years during their growth stage. Further the responses also quote “In unmanaged landscapes, disturbances are usually spatially heterogeneous leading to mixed-age stands. We use AGB stock as a proxy for age, and assign growth rates based on stock, rather than age.” Further, it is very evident from the Figure 19 that r_{max} appears to be the parameter with highest degree of uncertainty among the other 5 significant parameters. Hence the justification provided for using the r_{max} value as Secondary ≤ 20 years is insufficient. The research has to transparently demonstrate the results considering the r_{max} values with following scenarios, 1. Primary Forest 2. Secondary Forest >20 years 3. Secondary ≤ 20 years 4. Average of Primary Forest, Secondary Forest >20 years and Secondary ≤ 20 years And results of the iterations to be correlated with the actual forest cover loss occurred between 2010 and 2020. Further through the MoFUSS simulations, a region specific r_{max} value can be set by taking actual ground scenario into considerations.	We would strongly recommend the researchers to conduct iterations of MoFUSS model with different rmax values to match the actual forest cover loss occurred in the past. The most realistic / region specific growth function of the biomass to considered based on the test results. Proposed text: *“Aboveground net biomass growth rate has been set region specific through the calibration of MoFUSS model with the data changes occurred in the last decade in order to realistically estimate the biomass availability”*	

[1] https://www.fao.org/faostat/en/#data/RL last accessed on 31 July 2024

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<td>5</td>
<td>Section 2.11 Page No – 14 to 15 Para No – 43 to 48</td>
<td>Whole section</td>
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Quantifying household woodfuel consumption

The Para 45 acknowledges the KPT results shared by the project developers indicated the annual wood consumption exceeds 400 kg per year and in acknowledgment to this, the research team has adjusted wood consumption upwards and final value considered in the model is as given in the Table 4.

There are following concerns in the Table 4,
1) There is a typographic error in the unit mentioned in table 3 as unit mentioned as “kg” whereas the values are in “tons”
2) It is unclear why the research team has still used the default value of “0.40 oven-dry tons/person-year” for Sub-Saharan Africa (SSA) alone, while for other regions conservative value of either PDD value or UN & DHS data has been considered.
3) A value of “1.10 oven-dry tons/person-year” has been taken for Latin America whereas the conservative consumption value is “0.89 oven-dry tons/person-year”
4) For East Asia a value of “0.44 oven-dry tons/person-year” is taken as it is conservative of both the data sources, but it is not clear the value sourced from UN & DHS data “0.44” is on a wet basis or oven dry basis
5) Similarly, consumption value of “0.40 and 0.62 oven-dry tons/person-year” were considered for South Asia and other regions respectively, while conservative oven dry ton values of “0.32 and 0.59” were not considered.
6) There is a lack of transparency in providing the source of UN & DHS data that whether the value provided is a weighted or simple average of all the countries in that particular region? The given values are on wet basis or in oven dry basis? Timeline of the dataset used?
7) Further it is not clear, what is the proportions of charcoal and wood users were considered in the model? and does it align with the host country data sets.
Further, the Note #11 explains wood to charcoal fuel consumption conversion calculation approach, but there are ambiguities in the charcoal values used in the model as listed below,
1) Charcoal consumption for Latin America works out to “0.18 tons/person-year” almost comparable of Sub-Saharan Africa despite a very huge difference between their fuelwood consumption.
2) South Asia’s charcoal consumption value is seeming to be much higher than SSA even their fuelwood consumptions values are at par
3) Similarly for East Asia & Other regions wood to charcoal conversion ratio were not matching with the proposed conversion calculation approach
The research team shall clarify these significant differences in the charcoal consumption values provided in the Table 4 and charcoal conversion calculation approach given in the footnote #11 are not matching except for the SSA region.

To sum it up the research team has to address the aforementioned inconsistencies and come-up with a realistic wood fuel and charcoal consumption value rather than the vague assumptions especially for SSA. Further the country specific consumption values to be used to yield the accurate results.
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We highly recommend the researchers to use the most appropriative country specific wood fuel consumption values based on any official statistics or UN / IEA data or through localised surveys etc. The yielded total household biomass consumption through MoFUSS simulation shall be compared and calibrated host country data sources.

Proposed text:
“The region-specific wood fuel demand is estimated based on the consumption statistics as per any of the reliable sources such as regional study, official statistics, IEA statistics, UN data, localized surveys, registered PDD etc.”
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6 | **Page 12 to 15** | **Para 39 to 48** | **Te**

Residential, commercial, and industrial woodfuel consumption

The MoFUSS model does a vague assumption to calculate the biomass for Energy Applications that includes residential, commercial and industrial consumption without any scientific / factual approach. It is not rational to assume the commercial, and industrial woodfuel consumption only based on 4 SSA countries and that too having a significant outlier among the citied examples.

For an instance for SSA, the following approach has been considered for calculating biomass for energy applications,

1. Assuming "0.4 oven-dry tons/person-year" as fuelwood consumption and "0.18 tons/person-year" as charcoal consumption
2. To account for other household energy consumption simply the fuelwood and charcoal consumption were multiped by 10% and 20% respectively.

The biomass for "Energy Applications" calculated by international sources for few SSA countries for an *"illustrative purpose"* as tabulated below,

#	Country	Woody Biomass Consumption (1000 m^3)[1]	% of Population having access to clean cooking[2]	Population in 2020[3]	Per capita fuelwood consumption (oven dry tons/capita/year)[4]
1	Uganda	84,013	0.7%	44,404,611	0.90
2	Nigeria	260,884	19.8%	208,327,405	0.74
3	Zambia	30,081	10.4%	18,927,715	0.84
4	DRC	139,036	4.1%	92,853,164	0.74
5	Zimbabwe	22,851	30.5%	15,669,666	0.99
6	Congo	5,909	35.9%	5,702,174	0.76

Data Sources

1 UN Energy Statistics Database[2] and includes total woody biomass consumption for energy applications for the year 2020

2 WHO database in the MoFUSS study for the year 2020[3]

3 Population data for 2020 from World Bank Source[4]

4 Wood density is considered as 0.59 m^3/ton[5] based on research study

Since it is not very clear on the proportions of wood and charcoal users considered in the model, but by assuming 75% and 25% are fuel wood and charcoal users respectively, then the total biomass consumption for "Energy Application" works out to "0.65 oven dry tons/capita/year". This value is even lower than PDD value of "0.70 oven dry tons/capita/year" that too for residential application alone as given in table 2.

As can be inferred in the above table that per capita biomass consumption for "Energy Application" far exceeds the assumed value.

Hence, we would strongly recommend the MoFUSS research team use the county specific biomass consumption values rather than using such vague assumptions.

The research team to come up with reliable sources like regional study, official statistics, IEA statistics, UN data, localized surveys, registered PDD etc." for calculating biomass consumption for Residential, commercial, and industrial wood fuel rather than basing the data over assumptions.

[2] http://data.un.org/Data.aspx?q=fuelwood&d=EDATA&f=cmID%3aFW last accessed on 31 July 2024

[3] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/gho-phe-primary-reliance-on-clean-fuels-and-technologies-proportion last accessed on 31 July 2024
[4] https://data.worldbank.org/indicator/SP.POP.TOTL?end= last accessed on 31 July 2024
[5] https://www.sciencedirect.com/science/article/abs/pii/S037811271000424X last accessed on 31 July 2024

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<td>Page No – 13 to 14
Para No – 41 and 42</td>
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Accounting for non-energy wood demand and timber plantations

The para 41 and 42 justifies the exclusions of non-energy wood demand for applications like building materials and timber exports citing the reasons such as non-availability of the forest plantation maps, minimal inaccuracies of non-consideration of non-energy biomass consumption etc. However, the research team has not clarified that how they ensured that exclusion of forestry plantations from the 2010 NASA data of Global Aboveground and Belowground Biomass initial stocks given the challenges in the accessing the forest plantation maps. If in case the MoFuSS does not exclude the forest plantations in its initial biomass stocks, then the consumption of non-energy wood demand should also be considered in the MoFuSS model.

Further para # 42 quotes an example of South Africa, wherein despite with mature forestry industries the plantations are about 2% of country's total area. This perspective is deceptive, since the plantation area constitutes around ~18% of South Africa's total forest area (Natural + Plantation). Also, there are countries in SSA such as Burundi, Uganda, Rwanda etc. having considerable share of forestry plantation.

The below table depicts the extent of forest plantations w.r.t total forest area (Naturally regenerating + Plantations)

<table>
<tr><th rowspan="2">#</th><th rowspan="2">Country</th><th colspan="4">Total Forest Cover (1000 ha) as on 2020</th></tr>
<tr><th>Natural</th><th>Plantation</th><th>Total</th><th>% share of Plantation</th></tr>
<tr><td>1</td><td>Mauritius</td><td>21</td><td>18</td><td>39</td><td>46.3%</td></tr>
<tr><td>2</td><td>Burundi</td><td>167</td><td>113</td><td>280</td><td>40.4%</td></tr>
<tr><td>3</td><td>China</td><td>135,282</td><td>84,696</td><td>219,978</td><td>38.5%</td></tr>
<tr><td>4</td><td>Rwanda</td><td>276</td><td>126</td><td>402</td><td>31.3%</td></tr>
<tr><td>5</td><td>Viet Nam</td><td>10,294</td><td>4,349</td><td>14,643</td><td>29.7%</td></tr>
<tr><td>6</td><td>Uganda</td><td>1,873</td><td>465</td><td>2,338</td><td>19.9%</td></tr>
<tr><td>7</td><td>South Africa</td><td>13,906</td><td>3,144</td><td>17,050</td><td>18.4%</td></tr>
<tr><td>8</td><td>India</td><td>58,891</td><td>13,269</td><td>72,160</td><td>18.4%</td></tr>
<tr><td>9</td><td>Mauritania</td><td>269</td><td>44</td><td>313</td><td>13.9%</td></tr>
<tr><td>10</td><td>Niger</td><td>957</td><td>123</td><td>1,080</td><td>11.3%</td></tr>
</table>
Data Source: Food and Agriculture Organization of the United Nation, 2020
Hence the research team shall clarify that the approach adopted for demarcation of natural forest and plantations in the 2010 NASA biomass map since SSA regions and other South Asian nations have significant portion of plantations or else the non-energy wood demand to be accounted in the MoFUSS model.
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<td>The research team to clarify their approach of exclusion of forest plantations in their initial biomass stocks sourced from 2010 NASA biomass maps. Otherwise, the biomass demand for non-energy applications namely building constructions and timber export needs to be included in the model.</td>
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8	**Para No – 2 & 3 Pg No – 25 of 67**	**Whole Para 2 & 3**	**Te**	**Marginality Concept** While the current fNRB approach does indicate the portion NRB of total biomass consumption in a country, but it does not explicitly reveal actual NRB portion of biomass savings achieved by the project activity. In other terms the current approach applies pre-calculated fraction of NRB in the fuel saved, but it cannot clearly demarcate the true portion of biomass that is fully non-renewable. Hence a concept of “Marginality” is needed in the fNRB computation which calculates the real NRB portion of biomass saved by taking both baseline and project demand scenario into consideration, since there is a higher chance that the biomass saved from the project activity can be obtained pre-dominantly from non-renewable biomass sources. The parallels of introducing the marginality concept in fNRB calculation for cookstove methodologies can be drawn from the emission reduction approach in energy efficiency projects like AMS II.C, wherein a marginal grid emission factor (instead of the average grid emission factor) is applied to quantify the emission reduction impacts. This would mean the methodology clearly looks at the source of the saved units of electricity where it would have been potentially generated (mostly costly and non-renewable sources) and uses its emission factor. In the other perspective, if an average grid emission factor is applied in the emission reduction calculation the climate impacts will be significantly undervalued. Hence it is very appropriate to consider the saved electricity that will marginally offset easiest generation source. The similar analogy should be also applied in the clean / improved cooking methodologies to measure the real climate impacts by looking at the source of marginal biomass offset. Ironically, the existing fNRB approach applies predefined NRB fraction on the saved biomass based on baseline scenario and it fails to differentiate how much of saved fuel is truly sourced from NRB based on current demand scenario. Most importantly fNRB being a relative and temporal parameter as it changes with respect to biomass supply and demand scenarios, hence it is not appropriate to apply the fNRB in both baseline and project scenarios, rather it should be applied on the marginal changes i.e., Delta between baseline biomass consumption and reduced biomass consumption that occurred due to the project scenario, therefore it is evident that the current fNRB approach undervalues the climate impact created by the clean cooking and safe water projects. This marginality concept for fNRB calculation is widely discussed amongst the clean cooking communities and definitely an actionable item. The application of the marginal fNRB calculation approach will be very much conducive with the sophisticated and scientifically advanced MoFuSS tool, which can compare the baseline and project demand models with ease. As a sum up, the marginality concept in fNRB needs to be further investigated and illustrations to be developed by the MoFUSS developers.	Our Recommendations to research team is to include the marginalization module in MoFUSS tool to accurately capture the climate impact created by the clean cooking and safe water projects and also to assess the real forest cover change scenario. A stakeholder consultation meeting can be conducted by inviting various SMEs from Global South, academicians, Carbon PDs etc. to brain storm the concept of marginality and eventually to include this feature in the MoFUSS tool.	
9	**Overall Feedback**		**ge**	The true intention of the MoFUSS model is to realistically estimate change in tree cover, capture the phase of forest degradation and ramp up the actions towards climate change mitigation. However, use of outdated input information, unscientific and unclear assumptions, non-use of localized data sets and most importantly lack of validation and calibrations with the real ground situations will defeat the true intent of this scientific work and creates scepticism within the carbon project developers, host country DNAs and other affected stakeholders.	Incorporation of country specific inputs, scientific / rational approach wherever necessary and much needed validation exercise to demonstrate the precision and accuracy is needed for widespread acceptance of the MoFUSS tool.	