TABLE FOR COMMENTS

Name of submitter: \_Abhishek Mahawar\_\_\_

Affiliated organization of the submitter (if any): \_\_KOKO Networks Limited\_\_

Contact email of submitter: \_\_a.mahawar@kokonetworks.com\_\_

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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** | **5.5** | **18** | **ge** | **MoFUSS Model - A Black Box**  MoFUSS has been presented as a fait-accompli “black box” model to stakeholders, without transparency on the equations, parameters and mechanics of the model.  Given that the draft country default outputs of the model would deliver a major reduction in the climate finance flows available for developing countries to transition to modern cooking energy, it is incumbent on the UNFCCC to require greater transparency from MoFUSS.  We have also been advised that various manual adjustment factors have been introduced into the model which are not part of the base assumptions or datasets, but instead input manually by the MoFUSS team in order to produce the desired outcomes of lower climate finance flows.  Stakeholders have raised this issue on multiple occasions in prior consultations and appear to have been ignored – no further information or reasonable justification on the lack of transparency has been provided by the MoFUSS team or by UNFCCC. | 1. As a minimum, UNFCCC should make public the following resources: 2. Schematic Diagram (FlowChart) to demonstrate the detailed working of the MoFUSS model along with all the equations used in the model 3. List of all assumptions, datasets and satellite imaging sources used by the MoFUSS model 4. All intermediary and final parameters obtained from the simulations of the model for different countries and continents. 5. All adjustment factors that have been manually input by the MoFUSS team, and the justification for each of these factors. |  |
| **2** | **5.5** | **18** | **ge** | **Unavailability of the Code Scripts for Public Evaluation**:  KOKO engaged a working group (WG - fNRB) which comprises internal data science experts from KOKO and external data consultants, to undertake a comprehensive technical replication of MoFUSS outputs using the official model and documentation.  Despite best efforts, the working team encountered several technical barriers, including missing input files, undocumented dependencies, and output inconsistencies—particularly in the IDW processing and NRB layers. These limitations have hindered independent validation and risk undermining confidence in the replicability and applicability of the model across diverse geographies.    We also contacted the MoFUSS team to get clarity and support to reproduce the results, but did not receive adequate support from them. | 1. We request UNFCCC to provide public access to all the final code scripts to allow all stakeholders for evaluation of the scripts. The codes should have appropriate structuring and explanation for different parameters and calculation method. 2. We were also apprised by our working group that there is an improvement opportunity to recode the MoFUSS scripts in a more structured manner to allow easy understanding and efficient execution. We would be happy to support any such initiative in the interest of all stakeholders. |  |
| **3** | **5.5** | **18** | **te** | **Alarming difference in national woodfuel demand and harvest figures driven by arbitrary cap on harvesting probability**  We executed the publicly available MoFUSS scripts for Kenya, with the results showing that there is an alarming difference of **70%** in the annual demand and the annual harvest at the national level.  This is erroneous as the actual harvest would be higher than the cooking fuel demand (due to unaccounted commercial demand) and by no mean shall be lower than the demand.  In contrast, Tool 30 correctly calculates the harvest from the cumulative demand generated from each sector as wood/charcoal imports are generally not significant to change the harvest.  **If we treat the harvest as the total woody biomass demand (in line with Tool 30) and retain the NRB estimated by the MoFUSS model, then the fNRB is shown at 71.28%, which is 247% higher than the draft country default value.**  The reason for this anomaly in the MoFUSS model appears to be the arbitrary capping of the harvesting probability. This arbitrary cap appears to be a policy decision not based in science or fact.  The MoFUSS team have not clarified why they applied this arbitrary cap, nor justified this decision with evidence and data.  On the contrary, evidence from a wide range of African nations have consistently reported significant losses and degradation of forests, which suggests that an arbitrary cap on harvesting is not based on observed reality. | 1. We request that UNFCCC remove the arbitrary cap on harvesting probability, or alternatively ensure that the MoFUSS team provides detailed evidence supporting their policy decision to impost an arbitrary cap. 2. A possible approach, to identify such anomaly and allow stakeholders to understand and engage constructively, is to generate an excel sheet with results of each intermediary and final parameters of each module in a time series from 2010 to 2050. This will allow stakeholders to understand the year-on-year change occurring in the parameters and how they are impacting the fNRB. This will also allow UNFCCC & the stakeholders to cross-check these with the locally available data-sets. |  |
| **4** | **5.5** | **18** | **te** | **Exclusion of Non-Renewable Woody Biomass Loss from Conversion of Land to Cropland**  As an assumption, the standard runs of MoFUSS exclude any wood that comes from land clearing for agriculture or other non-fuel purposes, unless explicitly turned on.  The rationale proposed is that while such wood is indeed non-renewable (the trees are gone and won’t regrow because land use changed), it should not count towards fNRB for energy because those trees would have been cut regardless of fuel demand.  In other words, if farmers clear a forest to plant crops, and the felled trees happen to be used as firewood, that does not make the cooking fuel demand responsible for the tree loss. The assumption in default mode is that this effect is negligible or omitted.  The reality is quite the opposite.  The 2 problems of deforestation for cropland and non-renewable biomass consumption are deeply intertwined and cannot be addressed separately because of following reasons:   * The logging operations for procuring woodfuel often create access roads and infrastructure that open up previously remote forest areas. These developments make it easier for agricultural interests to move in, leading to the conversion of forests into farmland or pasture. In many cases, the initial fuelwood-driven logging is followed by agricultural activities, such as cattle ranching or crop cultivation, which further exacerbate deforestation. * The economic value of woody AGB far exceeds the economic gains achieved from agriculture. This would make agriculture on forest land/grasslands economically infeasible in absence of economic pricing of the logs. * The argument of expansional agriculture in absence of wood demand is irrational from Kenya and other African countries due to presence of only small land holders in the country who do not have the resources to follow such a capital-intensive practice.   As explained in Comment 7 below, Charcoal and purchased wood forms a significant part of the total biomass consumption in any African country, including Kenya. Hence, the grasslands/forest land is first cleared for wood procurement and later on prepared by the farmers as a cropland for agriculture. | 1. We request that the UNFCCC recognize that the African observed reality of fuelwood-driven deforestation, and recognise fuelwood demand currently allocated to expansion of cropland be re-iincluded in the MoFUSS calculations for fNRB.      1. The CRT reports can be used to establish the tree cover loss/carbon stock loss due to cropland expansion to allow easy correction in the MoFUSS model. 2. As per our internal estimates for Kenya based on yearly CRT reports, the loss of biomass due to expansion of cropland will contribute to the total Demand & NRB between 20% and 50% which can substantially change the fNRB value. |  |
| **5** | **5.5** | **18** | **te** | **Reconciliation of AGB Rasters**  It shall be noted that MoFUSS model, unlike Tool 30, is highly sensitive to potential errors in the assumptions in the following areas:   1. Calculation of harvest and regrowth, due to pixel level calculation of the harvest & regrowth difference 2. Estimation of Initial/base biomass used in the base raster as it served the initial principal for compounding the growth over 2-3 decades.   MoFUSS uses an estimate (within the AGB 2010 raster), of total standing AGB in Kenya of 1975 Million tons of Oven Dried Biomass.  This figure is 160 – 230% higher than the figures reported in publicly available literature, specifically:   1. Global Forest Watch, one of the most trusted source for biomass data, has reported total woody biomass for Kenya as 847 Million tons for the year 2000 which includes all areas above 10% canopy cover (<https://gfw.global/437ogXN>). Additionally, the tree cover has decreased by 6% from 2000 to 2020. 2. The Country specific Forest Assessment Report for Kenya by FAO also presents the total AGB around over dried 595 Million tons for 2010.   The range of 595 Mt – 747 Mt in the GFW/FAO data, versus the 1975 Mt used by MoFUSS, is extremely material to the estimates produced by the model. | 1. We request that UNFCCC ensure that MoFUSS transparently discloses the intermediary parameters like total AGB data in reference to the values published in the relevant literature, and justify the reasons for difference in the values. |  |
| **6** | **5.5** | **18** | **te** | **Interpolation Error**:  Some of the dataset used by MoFUSS model like rmax and K are adopted from external sources like GEDI which were defined for the whole of Sub-Saharan Africa, which includes a wide range of biomass cover – from high biomass rainforests through to arid lands. When this continent-wide value is applied to a mostly-arid country like Kenya, it is materially over-estimating the regrowth.  **Averaging Error:**  The MoFUSS model is leading to erroneous averaging out of the rmax and K parameter due to inconsistent granularity of the available data sets for land type of Kenya and rmax, K values for Sub Saharan Africa. It shall be noted that the Standard deviation of the rmax values is much higher than the mean value.  For example, grasslands contribute more than 65% of AGB in Kenya and rmax used for grasslands is possibly an average of 2 datapoints with a very high range of 0.05 to 0.25. **Even with 10% deviation in the rmax value, the fNRB could deviate by 70%**. Monte Carlo simulation will only take random values as the starting point but will not remove the impact of the rmax variation on fNRB.  See the below table for the CV value for rmax and K values that are used in the model.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | LC Cat | Mean\_rmax | SD\_rmax | CV | Mean\_K | SD\_K | CV | | Barren | 0.00 | 0.000 | NA | 11.00 | 12.50 | 114% | | Closed Shrublands | 0.11 | 0.099 | 88% | 86.00 | 15.50 | 18% | | Cropland/Natural Vegetation Mosaics | 0.19 | 0.162 | 86% | 56.50 | 11.10 | 20% | | Croplands | 0.26 | 0.227 | 88% | 42.60 | 8.40 | 20% | | Deciduous Broadleaf Forests | 0.09 | 0.082 | 87% | 115.89 | 14.22 | 12% | | Deciduous Needleleaf Forests | 0.00 | 0.000 | NA | 32.00 | 1.00 | 3% | | Evergreen Broadleaf Forests | 0.05 | 0.048 | 91% | 181.70 | 16.80 | 9% | | Evergreen Needleleaf Forests | 0.11 | 0.097 | 91% | 105.00 | 12.56 | 12% | | Grasslands | 0.15 | 0.134 | 88% | 61.30 | 15.50 | 25% | | Mixed Forests | 0.08 | 0.071 | 88% | 130.22 | 13.44 | 10% | | Open Shrublands | 0.18 | 0.157 | 88% | 54.70 | 10.40 | 19% | | Permanent Wetlands | 0.09 | 0.076 | 86% | 104.80 | 18.20 | 17% | | Savannas | 0.11 | 0.100 | 88% | 82.30 | 16.30 | 20% | | Urban and Built-up Lands | 0.00 | 0.000 | NA | 32.40 | 19.80 | 61% | | Water Bodies | 0.00 | 0.000 | NA | 18.10 | 18.90 | 104% | | Woody Savannas | 0.08 | 0.064 | 85% | 129.60 | 17.80 | 14% | | 1. Stage 1: As the variability of rmax value for each country is expected to be very high and there are no accurate research studies conducted at national level to predict such value, it is better to define the default value as regional (Sub-continental) level instead of national level. This will eliminate the errors due to interpolation of data as well as reduce the expected variability as more research reports can be found at regional level. 2. Stage 2: We recommend that Regional Research Groups shall be engaged along with the UNFCCC-RCCs to collect more data on rmax and K to fine-tune to values for each region, to achieve lower standard deviation of these critical values. |  |
| **7** | **5.5** | **18** | **te** | **Flawed Woodfuel Procurement Assumption**:  The MoFUSS model completely ignores the reality of woodfuel market supply chains, which are the primary commodity-based drivers of deforestation in Africa.  MoFUSS erroneously assumes that households collect their own wood, despite the estimated $40 billion market for charcoal/wood across Africa that is transported long distances with multiple actors across the supply chain.  Approximately 50% of the wood-equivalent consumption is driven by charcoal demand, an energy commodity that is purchased by households rather than self-produced. Most of this demand is in urban / peri-urban areas, despite the upstream production of the charcoal occurring often hundreds of kilometres away in the forests.  Similarly, the wood markets – whilst less destructive than charcoal – do also involve commercial supply chains, including the original upstream actor felling trees and curing wood.  It is this **commodity market demand** for charcoal and wood that provides the economic signal for deforestation and forest degradation through charcoal and traded wood.  Foraging or self-procurement of dry wood by sparsely populated rural communities is the dominant/only assumption in the MoFUSS model, which is why the model is producing such artificially low country default factors.  This flawed Procurement assumption is further compounded by the Accessibility assumption.  **Flawed Accessibility Assumption:**  The flawed procurement assumption (all households collect their own woodfuel) has driven a knock-on flawed assumption that the grasslands are therefore the source of woodfuel.  As an example, the MoFUSS model for Kenya assumes that 100% of the forests are inaccessible, and that 92% of the grasslands are accessible.  The evidence in Kenya is significantly different from this flawed assumption:   1. All charcoal production clusters are sourcing major volumes of wood from the forests, including both protected and unprotected areas. 2. The majority of protected/designated areas in Kenya actually cover t grasslands, and so only 65% of the grasslands are accessible as per the available literature survey.   The assumed 92% accessibility of grasslands is heavily distorting the regrowth AGB available for consumption in a grassland pixel leading to underestimation of fNRB for Kenya & other arid countries. | 1. We request that UNFCCC correct the major flaws in the woodfuel procurement assumption, so that a more science-based approach to the reality of urban charcoal demand and long associated supply chains is reflected in fNRB. 2. We request that UNFCCC correct the flaws in the Accessibility assumption, which is driving a distortion in the regrowth AGB for arid countries such as Kenya. |  |
| **8** | **5.5** | **18** |  | **Poor Resolution of Satellite Imaging**  Further, due to use of a continental data-set, MoFuSS is compelled to operate at a spatial resolution of 1 km² for estimation of AGB, which is a very poor resolution for accurate biomass identification and estimation.  Our working group asserts that 1 km2 of resolution will create a high level of uncertainty in estimation of AGB, as each pixel assumes a constant fixed value of AGB and doesn’t allow possibility of variation within the pixel.  The error exponentially increases the closer the level of visibility (eg country, to state, to administrative block), and results in absolutely absurd results at administrative block level.  Thes absurd inconsistencies at the administrative block level have already been identified by many stakeholders during the previous consultation rounds, but do not appear to have been addressed by MoFUSS.  A screenshot of a computer screen  AI-generated content may be incorrect.The below picture highlights the change in estimation based on the picture resolution: | 1. We request that UNFCCC require satellite imaging at a 30m resolution level in order to have more accurate estimates of woody biomass and fNRB at regional levels. This could be applied either in the country deault value, or alternatively permitted in project-specific values that undertake more in-depth analysis using 30m resolution. |  |
| **9** |  |  |  | **Ultra-conservative demand assumption does not reflect reality**  The MoFUSS Team published (June 2024) a Kenyan cumulative Biomass Harvest assumption of 264 Million tons for the period 2020-2030, which formed the basis of 29% fNRB.  We accessed the CRT data published by Kenya from 2010-2022 to cross-check the demand forecast of MoFUSS model. The actual Woody Biomass consumed in Kenya from 2011-2020 period was 252 Million tons.  Kenya’s population is growing at 2% per annum, but the urbanization rate is 4% per annum. Because urban populations cannot self-collect their woodfuel, this is increasing the demand for more-destructive charcoal sourced from the forests, which has a demand-multiplier effect (given the wood-to-charcoal conversion factor).  For a conservative BAU scenario for 2020-2030, it would be appropriate to apply an average growth rate of 5% per annum in fuelwood demand, which would result in demand of 418 million tons as outlined in the table below. This 5% growth rate also approximates the actual growth rate observed by data from the period 2010 – 2022.  **This forecast, which is validated by data from the first 2 years, is 58% higher than the ultra-conservative estimate provided by the MoFUSS model.**  For the MoFUSS model forecast to be true, then average demand would have to actually decrease by 8% per year, which is simply not evidenced by the data from the first 2 years of actuals.  It should also be noted that biomass consumption from energy sector does not include non-energy consumption, which is estimated to add to at least 5% incremental demand to the harvest, taking the total cumulative demand to approx. **440 Mn tons for 2020-2030**.  This figure also reconciles with per capita wood consumption of 0.72 tons/person/year shown in the PD Forum’s compilation of Africa specific 24 data-sets of KPT survey results.  It is clear that this critical assumption in the MoFUSS model is not based on science or evidence, but rather driven by a policy of extreme conservatism, the impact of which is to dramatically overstate the sustainability of woodfuel consumption in Kenya, and in turn reduce the availability of climate finance to actually solve the problem through transition to modern cooking energy.   |  |  |  |  | | --- | --- | --- | --- | | **Year** | **S1 - Energy: Biomass (TJ)** | **S1 - Energy: Biomass (Mn Tons)** | **Growth** | | 2010 (A) | 305,232.47 | 19.57 |  | | 2011 (A) | 314,108.69 | 20.14 | 1.03 | | 2012 (A) | 325,706.82 | 20.88 | 1.04 | | 2013 (A) | 351,498.65 | 22.53 | 1.08 | | 2014 (A) | 354,303.83 | 22.71 | 1.01 | | 2015 (A) | 357,193.32 | 22.90 | 1.01 | | 2016 (A) | 411,791.72 | 26.40 | 1.15 | | 2017 (A) | 424,059.56 | 27.18 | 1.03 | | 2018 (A) | 428,916.27 | 27.49 | 1.01 | | 2019 (A) | 477,401.89 | 30.60 | 1.11 | | 2020 (A) | 488,748.59 | 31.33 | 1.02 | | 2021 (A) | 504,910.44 | 32.37 | 1.03 | | 2022 (A) | 544,974.83 | 34.93 | 1.08 | | 2023 (E) | 572,223.57 | 36.68 | 1.05 | | 2024 (E) | 600,834.75 | 38.52 | 1.05 | | 2025 (E) | 630,876.49 | 40.44 | 1.05 | | 2026 (E) | 662,420.31 | 42.46 | 1.05 | | 2027 (E) | 695,541.33 | 44.59 | 1.05 | | 2028 (E) | 730,318.39 | 46.82 | 1.05 | | 2029 (E) | 766,834.31 | 49.16 | 1.05 | | 2030 (E) | 805,176.03 | 51.61 | 1.05 | |  |  |  |  | | **Cumulative Demand 2011-2020 (actual)** |  | **252.16** |  | | **Cumulative Demand 2021-2030  (2yrs actual, 8 yrs estimates)** |  | **417.57** |  | | 1. We request that UNFCCC insist on science-based methods in the estimation of woodfuel demand, taking into account both population growth and urbanisation rates, in addition to the observed evidence from studies during the first years of the studied period. 2. We similarly request that arbitrary caps being introduced into the process for deriving these estimates be discontinued, in favor of a process of using science to derive accurate estimates, in order to bring credibility to the MoFUSS model. 3. We request that UNFCCC shall take due consideration of CRT reporting as solid evidence that biomass consumption for a cooking is a massive challenge in Africa and requires sustained climate financing channeled towards modern cooking energy transitions that are aligned with the Paris Agreement. |  |
| **10** | **6** | **7** | **ge** | The recommendations made by the EB in the March appear have been completely disregarded by the Methodology Panel, specifically:   1. “Explore further the data on the calculation of urban fraction of non-renewable biomass (fNRB) and the localisation of wood harvesting for charcoal production supplying the urban areas”. This is essential to differentiate between the wood-focused rural cooking reality and the charcoal-intensive urban cooking reality. 2. The recommendation of identifying optimal geographical disaggregation is not followed appropriately, due to:     1. It is not clear what the standard deviation data represents. The expected standard deviation for any CDM tool is normally calculated as the standard deviation of the data set from the true value. For example, dataset of sample cookstoves which is used to estimate the true value of the population.    2. The MoFUSS model does not generate data set for different samples but runs the monte carlo simulation using random values of few parameters within the defined range to generate sample data. This does not allow full scale variation of the independent variables and represents only 30 iterations (as per the last communication made by the MoFUSS team).   As explained above, the systemic errors, variations and uncertainties would be higher at sub national or national level but may become lower at Regional/Continental level | 1. We request the UNFCCC to require the Methodology Panel to undertake the work in accordance with the CDM EB recommendation regarding Urban and Rural segregation in Tool 33. 2. We request the UNFCCC to conclude that the analysis of standard deviation is not practical in case of MoFUSS model, and require a more thorough cross-verification of the intermediary data. |  |