Comments to ART-TREES Version 2.0

April 2, 2021

My review has just focused on aspects that have been revised in this version, and not much on clarifications. I have also raised issues that I consider to be critical and even wrong.

- Overall concept: I think I did not make this comment earlier, but I suggest you present the requirements with paragraph numeration so that countries and VVBs can make easy reference to these requirements. This really facilitates the VVB's job and helps to refer to the right place every time…and it helps reviewers in their references.

Section 3.1 – Eligible entities

- "*Participants shall be national governments (i.e., the highest level of government that exists in the country), subnational governments no more than one level down from national level*" → perhaps you should clarify "no more than one **administrative** level down from the national level", otherwise one level below the national can mean anything. This is important to ensure clarity for the VVB.
- "*recognized indigenous communities*" → you will need to define what is a recognized indigenous community. Recognized by whom and what indigenous communities mean. Otherwise a VVB won't be able to validate this.
- "*recognized indigenous communities*" → In the next section they refer these as *recognized indigenous territory*. Please use consistent terminology.

Section 3.1.1 – Subnational accounting

- "*Participants registering subnational accounting areas may be a national government, a subnational government, or a recognized indigenous territory*" → In the previous section we refer to **recognized indigenous communities**. Please use consistent terminology.

Section 4.1 – Accounting requirements

- "*GHG removals for a given year shall be the product of activity data multiplied by removals factor by the time elapsed since the activity began, such that*" → I know this is an oversimplification to give an idea, but you should note that this could lead to confusion/error as this assumes that all the activity began the same year. If you have 50% of reforestation done in one year and 50% of reforestation done the following year, this equation would overestimate removals as 50% of the area did not generate removals since the beginning of the activity.

Section 4.1.1 Activity Data

- "*Data collected before the Participant joined ART are not required to meet these requirements. However, data collected after the Participant joins ART must meet these requirements.*" → Excellent clarification. You may want to clarify what "join ART" actually means. Does it mean at the time of submitting the concept note to ART or having the acceptance? This is to ensure that VVBs and countries have the same understanding of the requirement.

- "*Conditions specific to stratified area estimates approach: 2. Detailed information shall be reported as follows: **the user- and producer accuracy of the classes** used for activity data reporting; *" → I assume that this was a suggestion from FAO. This has been already discussed with them as part of the preparation of SOPs templates for area estimation. This requirement makes sense when you have the same number of classes in the map and the response design, AND when you have a sample unit and a spatial support that are identical, but this is rarely the case when it comes to stratified estimation. Therefore, you should not require it ("shall") as it does not have any practical implication in the standard.

- "*Conditions specific to stratified area estimates approach: 2. Detailed information shall be reported as follows*" → The required information is not super relevant I believe. There is <u>no requirement regarding the provision of the response design</u> which is the critical piece. The focus of the section is very much on sampling design, but the estimates are more sensitive to the response design and if there is an overestimation it will be due to the response design, not the sampling. Content for the sampling design, response design and analysis design may be found in Olofsson or for area estimation in the GFOI document https://www.reddcompass.org/documents/184/0/ActivityData_Inference_FAQ.pdf/8e93e100-c46b-4ff9-946b-6d0972fd50da .

- "*Conditions specific to systematic or random sample approach: 2.   When the systematic or random sample is post-stratified, provide all details as follows*" →
  - Ibidem.
  - Requiring accuracy metrics for post-stratification does not make any sense and it is not needed. You make reference to the Olofsson (2020) paper further above (in which I participated), and the recommendation is to create another stratum in the forest stable class which we call buffer. Having an accuracy metric is wrong as in the reference class we don't have a distinction between buffer and non-buffer, and even if we create this additional class, it does not provide anything that might be informative.

- In general, response design is missing across the three options, which I believe it is problematic as there we have the main source of material risk.

- **Removals**: There is little information around removals. Contrary to other activities, achieving an IPCC Approach 3 in removals is pretty important so as to be able to track different cohorts and stand age, etc. There should be something with this regard. This is pretty important for sampling approaches, as in some cases they don't track lands but there are ways around this defining the response design in the right way https://www.reddcompass.org/documents/184/0/ActivityData_Inference_FAQ.pdf/8e93e100-c46b-4ff9-946b-6d0972fd50da

Section 4.1.3 Removal Factors

- **Net removal factors**: While the section on emission factors provides enough detailed requirements to ensure conservative estimation, I find that the removal factor section misses some. For instance, it does not say anything about the pre-reforestation carbon stocks. So if a plantation is established in a shrub area, carbon stock changes from removing the shrub should be considered so as to ensure net removal factors. I see there is reference in Footnote 9 and Section 10, but it would be good to bring it here and provide some requirements on how to estimate CE for instance. <u>Perhaps include the same guidance as that for post-deforestation land use.</u>
- **Carbon pools**: There is no reference to carbon pools that can be accounted for (is in section 4.5. but there is nothing specific to AR). In afforestation/reforestation, under some instances certain carbon pools can be sources due to the soil preparation, conversion of grassland with high carbon content or drainage in peatlands. There should be some kind of provision requiring countries to demonstrate with peer-review publications, etc. that a certain carbon pool will not result in positive fluxes, and if it does that this will need to be accounted for.
- "*Models and equations may be used where justified, but shall be peer-reviewed¨ and demonstrated to be applicable (and where necessary, parameterized) to the specified use/geographical region, and must adhere to IPCC Tier 2 and Tier 3 methods.*" → models and equations should not be specific to the use/geographical region, but should be applicable to trees growing in the same edapho-climatic conditions regardless of the region. Also it would be good to indicate that if these lead to conservative estimates (low removal factors) it should be OK…these models and equations can be made conservative by multiplying them by conservative factors. This is similar to guidance under the CDM for models.
- **Legacies**: See comments below.

Section 4.5 Scope of pools and gases

- **Legacies**: There is no much around this and this is something critical for organic soils. You have proposed an elegant solution for removals, but for organic soils you will need to consider past removals, etc. A proposed approach may be found here https://www.forestcarbonpartnership.org/sites/fcp/files/FCPF%20Guidance%20Note%20on%20Accounting%20of%20Legacy%20Emissions%20and%20Removals_2021_0.pdf

Section 5.2 HFLD

- I believe this is an elegant solution for countries with upward historical trends, even if the historical trends are occurring the last years of the series (Congo). Two potential issues is that it is not applicable to countries without clear upward trends and it does not include expected plans for legally sanctioned deforestation (e.g. Gabon, Congo).
- "*The trend line must be developed using a quantile regression based on the median, or 0.5 quantile. The trend line must be based on at least seven (7) data points obtained over no more than 15 years immediately prior to the Crediting Period. Participants may not omit data points*

from the reference period and the final data point used must be no more than two years prior to the start of the Crediting Period" → Good approach that is not so sensitive to outliers, provides consistent predictions,…It would be good to indicate to provide data points distributed systematically across the reference period.

- "*In addition, Participants may optionally claim removals from the greenhouse gas storage that would have occurred during the crediting period in forest that would have been lost in the absence of the REDD+ program*" → Good idea.

Section 5.3 Removals.

- "*Annual areas of conversion of non-forest to forest land can be derived from remote sensing and/or verifiable recorded statistics, but the source of activity data must be consistent between the reference period and the crediting period. Annual areas of non-forest converted to forest land shall either be recorded or interpolated.*" → It is important that the records are not only of plantation but maintenance too. Often countries have records of area planted, and they assume there is no mortality, and this leads to large overestimations. So it is important to keep the temporal tracking of lands somehow.

- "*If stratification clearly distinguishes the areas of natural forest restoration, they can be excluded from additional crediting level analysis. All new areas of natural forest regeneration reported under ART are eligible for crediting*" → Good. Incentives to forest regeneration are needed. However, you will need to ensure that these are tracked during the crediting period and that removals since the beginning are monitored, including any losses.

- "**For strata which include commercial forest planting and restoration**, …." → I would say "For strata which include commercial forest planting and restoration, **OR only commercial forest planting** ….""

- "*When using stratified area estimates, or systematic or random sample based remote sensing approaches to estimate activity data, it shall be conservatively assumed the loss impacts the stratum with the highest removal factor.*" → I assume that this is related to the fact that in many countries applying the sampling approach they are not able to estimate the cohorts forest loss occurs in. However, this is not an issue of the sampling approach but the IPCC Approach. Sampling, either systematic or stratified, could be applied under an Approach 3 so it would be possible to assign losses of reforested area to different strata. Even if it is not an Approach 3, it is possible under an Approach 2 to assign losses to cohorts or age classes or strata. An interpreter could be asked to look at the prior classes to confirm if there was reforestation before, and in this case this would be labelled as a loss of regeneration or plantation. This is described in the GFOI document https://www.reddcompass.org/documents/184/0/ActivityData_Inference_FAQ.pdf/8e93e100-c46b-4ff9-946b-6d0972fd50da . . Hence, I would suggest that you don't refer to sampling, but "where it is not possible to track deforested land across periods and assign the loss to a specific regeneration stratum, it shall be conservatively assumed…etc.

Section 8   Uncertainty

- You should take a look to the following publication to consider lessons learned in terms of uncertainty analysis https://iopscience.iop.org/article/10.1088/1748-9326/abb96f/meta
- Monte Carlo → Please clarify that bootstrapping is an acceptable method so that the VVB is clear that this is an acceptable approach where no prior assumption of the PDF is required.
- Sensitivity analysis → This is a very important tool for countries to understand the sources of uncertainty and where they have to invest. Would suggest including this as a "should".
- "*Model and allometric errors are excluded11, as such errors are considered consistent between emissions in the crediting level and crediting periods, and thus the transaction cost and capacity building needed to include far outweigh any benefit in uncertainty determination*" → I am for simplification, but even if this error is fully correlated between crediting level and monitoring, the selection of the allometric model could be by far the most important source of error and relates to bias (not random errors). There should be some provision in TREES to ensure that the country selects the most appropriate allometric model applicable to trees growing in the program area and that QA/QC are implemented to ensure this.
- Would be good to clarify that CF, root-to-shoot ratios are to be propagated. Many countries might consider that these do not fit in the group of sampling errors as they are sourced from the literature.
- *11 In cases where emission factors are derived from biomass maps, uncertainty of this approach must be included* → Please make reference to the following biomass protocol for the calibration and validation of biomass maps. This has been defined in collaboration with the main researchers and space agencies to standardize how biomass maps are produced https://lpvs.gsfc.nasa.gov/PDF/CEOS_WGCV_LPV_Biomass_Protocol_2021_V1.0.pdf
- No major comments on the deduction. It provides some incentive to countries to reduce the uncertainty of their estimates, but the incentives are much lower than in other standards.
- "*Participants **must** take an uncertainty deduction corresponding to the calculated risk of over-crediting for the calculated emission reductions in accordance with Equation 5.*" → "shall"

Section 9.2 HFLD

- You should note that Peru would not be eligible under this definition.
- For a 50% forest cover, the deforestation rate would have to be of 0.01%, which is extremely low and probably not significant than zero. This makes it much more conservative than the Fonseca definition and threshold that was around 0.25%. In fact for a 0.25% deforestation rate forest cover should be of 75%. Perhaps the threshold should be set to 0.25, instead of 0.5, so a country with 50% of forest cover and 0.25% deforestation would be eligible, and a country with 0.5% of deforestation rate would have to have 75% of forest cover which is pretty high already.
- Positive side it is that it is flexible and forest cover can compensate a higher deforestation rate.

Section 10 Calculation of ERs

- Section is missing the HFLD Crediting Level. In the case of the HFLD crediting level, the crediting level would vary by year so equation 10 would have to be modified to include the subscript 't' in the notation. Perhaps a new equation might be needed.
- Are the removals from conversions occurring in the previous crediting periods included in all this? I really hope that is the case as it would be important that countries can capitalize on past efforts occurring as part of the program. If this is the case, then this should be made clearer. I have made few suggestions below to make it clearer.
- Calculation approach looks fine, but the naming of the different parameters is a bit confusing and also the notation in subscripts, as we have 't' for years but then we have 'b' which could represent a period but also a year. I would suggest few changes.
  - $A_{R,b1,x}$ is named "*Area of conversion of non-forest to forest in stratum x recorded and reported for the first time (b = 1 years since initial conversion); ha*" which is a bit confusing as according to equation 12 this depends on $rA_{t,x}$ which does not have the subscript 'b'. Therefore, I would suggest you call it "*Area of conversion of non-forest to forest in stratum x [additionally] converted in year t [as a result of program activities]; ha*" and the notation should be changed to differentiate it from the next parameter. Equation would then be $rA_{R,t,x} = rA_{t,x} - RRA_{n,x}$
  - $A_{R,b,x}$ is named "*Area of conversion of non-forest to forest in stratum x over the last b years; ha*" but as said earlier it is random that it depends on parameters with a subscript of t, while b denotes period. Moreover, we are really talking about area additionally converted as a result of the program. I would call it instead "*Area of conversion of non-forest to forest in stratum x as a result of the program activities since the start of the [crediting period] [the first crediting period] until year t; ha*". Notation should be $A_{R,t,x}$
  - $Def_{R,x}$ The issue with this parameter is that it is directly cumulative and it is not clear how it is estimated, if the cumulative is directly estimated or if it is estimated in each monitoring period and then it is summed. The issue with the former is that we could be double counting afforestation/reforestation as the area deforested would go down as a result of regeneration, and regeneration would be counted again as rAt,x. Therefore, I would leave clear in the equation that DefR,x is estimated annually, etc. . The notation should be $A_{R,t,x} = \left(\sum_1^t (rA_{t,x} - RRA_{n,x} - Def_{t,x} \right)$ and the naming of the parameter should be changed. Moreover, the parameter notation should contain the 'R', as it is the opposite of $rA_{t,x}$
  - $GHG\ REMV_t = \sum_x ((A_{R,t,x} \times RF_x) - (rA_{R,t,x} \times CE_x))$. Now the subscript 't' makes sense int his equation as it depends on the cumulative area of reforestation (AR,t,x) and the area of reforestation in the year in question (rAR,t,x).

$$GHG\ REMV_t = \sum_x ((A_{R,t,x} \times RF_x) - (rA_{R,t,x} \times CE_x))$$

$$rA_{R,t,x} = rA_{t,x} - RRA_{n,x}$$

$$A_{R,t,x} = \left(\sum_{1}^{t} (rA_{t,x} - RRA_{n,x} - Def_{R,t,x}) \right)$$

$GHG\ REMV_t$	GHG removals in year t; t CO2e
$A_{R,t,x}$	*Area of conversion of non-forest to forest in stratum x as a result of the program activities since the start of the [crediting period] [the first crediting period] until year t; ha*
$rA_{R,t,x}$	*Area of conversion of non-forest to forest in stratum x [additionally] converted in year t [as a result of program activities]; ha*
RF_x	Removal factor for stratum x; t CO2e/yr
CE_x	Conversion emissions (GHG emissions associated with pre-existing vegetation prior to forest restoration) for stratum x; t CO2e
$rA_{t,x}$	Area of conversion of non-forest to forest in stratum x during year t; ha
$RRA_{n,x}$	Reference Removal Area for stratum x during period n in the historical reference period; ha/yr
$Def_{t,x}$	Area of deforestation for areas previously reported as transitioning from non-forest to forest in stratum x during year t; ha

- "At the end of each crediting period the Participant may calculate an uncertainty deduction based on the summed uncertainty of gross emission reductions and removals during the total period of ART participation (calculated from summed reference emissions minus summed crediting period emissions). In cases where the uncertainty contributions to date exceed this total deduction number, additional TREES credits will be issued into the Participant's registry account." → would be good to clarify what summed means? Are they estimating uncertainty again for the whole periods as a standalone long period or it is a simple average? I think the former makes more sense.

Section 12 ENVIRONMENTAL, SOCIAL, AND GOVERNANCE SAFEGUARDS

- Under the FCPF CF, and more broadly for the readiness stage, countries have developed their safeguards instruments including SESA and ESMF as part of their ER programs or their REDD+ strategies. In many cases, ER programs have defined their safeguards systems based on the WB Environment and Social Framework https://www.worldbank.org/en/projects-operations/environmental-and-social-framework . Additionally there is the REDD social and environmental standards. Imposing different requirements from different parties and having different reporting mechanisms may increase transaction costs on the side of the country without having a significant impact in terms of safeguards. Therefore, I would suggest that TREES make reference to those other standards and that they may be used to demonstrate compliance with certain requirements, or clarify under certain indicators that these other frameworks may be used to demonstrate compliance.