Module 3 **31 July 2015**

Forest Reference Emission Levels and Forest Reference Levels: Extended Methodological Advice

1 Introduction

The Conference of Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) has adopted decisions 12/CP.17 and 13/CP.19 on Forest Reference Emission Levels (FRELs) and/or Forest Reference levels (FRLs)[1], which are benchmarks for assessing performance in implementing REDD+ activities. FREL/FRLs are to be quantified in tonnes of carbon dioxide equivalent per year, and consistent with greenhouse gas inventories (GHGI), taking account of historical data. Significant pools, greenhouse gases (GHGs), and REDD+ activities are not to be excluded from consideration. A stepwise approach makes it possible to improve FREL/FRLs by including better data, and improved methodologies, and, where appropriate, additional pools. Sub-national FREL/FRLs are possible as an interim measure; in this case, the national forest monitoring system will include the monitoring and reporting of displacement of emissions at national level, if appropriate[2]. FREL/FRLs are to be updated to take account of new knowledge, scope, methodologies and data. FREL/FRLs may be adjusted for national circumstances.

The COP has invited Parties voluntarily to submit information on proposed FREL/FRLs. Submitted information should be transparent, complete, consistent and accurate. Completeness implies that the information provided should allow reconstruction of the FREL/FRL. Submitted information should include data and methodological descriptions; information on policies and plans if relevant; changes from previous submissions if relevant; pools, GHGs, and activities included, and reasons for any omissions of pools and/or activities; the forest definition used, and reasons for any differences from forest definitions used for other international reporting. The rationale for any adjustments for national circumstances should be provided.

FREL/FRLs are to be subject to technical assessment (TA) with the objectives of assessing the degree to which agreed technical requirements reflected in the COP decisions have been met; and of offering a non-intrusive, technical exchange of information with the view of supporting the capacity of Parties for the construction of FREL/FRLs, and for further improvements in FREL/FRL submissions. Annex 1 to this module summarizes this process. Submissions with examples of proposed FREL/FRLs and TA reports can be found on the UNFCCC website[3].

The COP has decided[4] that as part of measurement, reporting and verification (MRV) procedures, Biennial Update Reports (BURs) are to contain information used by Parties in estimating GHG emissions and removals associated with REDD+ activities, consistent with FREL/FRLs. For Parties seeking results based payments, decision 14/CP.19 provides guidelines for elements to be included in technical annex to their BURs.

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[1] The Warsaw Framework for REDD+ was agreed in December 2013 by the 19th Conference of Parties (COP) to the United Nations Framework Convention on Climate Change. The Warsaw Framework is set out in Decisions 9/CP.19 to 15/CP.19 of the COP and is taken to include previous Decisions relevant to FRELs/FRLs for REDD+, particularly 12/CP.17. The Warsaw Framework is at http://unfccc.int/methods/redd/items/8180.php.

[2] See footnote 7, paragraph 71, sub-paragraph (c) of decision 1/CP.16.

[3] At http://unfccc.int/methods/redd/items/8414.php.

[4] See paragraphs 3 and 6 of Decision 14/CP/19. The guidelines referred to later in the paragraph (for elements to be included in a technical annex to BURs) can be found in the annex to 14/CP.19

This module addresses methodological issues associated with the construction of FREL/FRLs as benchmarks for assessing Parties' performances in implementing REDD+ activities, including discussing the meaning of technical terms used in COP decisions. The approach adopted was to work through decisions 12/CP.17 and 13/CP.19 in order to identify technical issues where it seemed that it would be useful to provide extended advice linked to the Methods and Guidance Document (MGD) of the Global Forest Observations Initiative (GFOI). Readers may also wish to refer to the material on reference levels in i) the *GOFC-GOLD Sourcebook*, ii) UN-REDD's *Emerging approaches to Forest Reference Emission Levels and/or Forest Reference Levels for REDD+*, also iii) the *Technical considerations for FREL and/or FRL construction for REDD+ under the UNFCCC* and the iv) *World Bank Carbon Fund Methodological Framework*[5]. These references contain useful discussions of technical issues implied by COP decisions on FREL/FRLs. The World Bank Methodological Framework applies to pilot implementation under the Carbon Fund of the Bank's Forest Carbon Partnership Facility (FCPF), and has some requirements (e.g. concerning conservativeness, and to limit adjustments) which are more elaborated or restrictive than the COP decisions, though not inconsistent with them.

This module extends the advice on technical issues associated with FREL/FRLs provided in sections 1.1 to 1.4 and section 5 of version 1 of the MGD. The intended audience is the same as that for the MGD, namely:

- technical negotiators working in the UNFCCC
- those responsible for design decisions in implementing national forest monitoring systems
- experts responsible for making the emissions and removals estimates.

2 Extended methodological advice

2.1 *Consistency with the greenhouse gas inventory*

Section 2.2 of the MGD describes how to estimate emissions and removals associated with REDD+ activities using the GHGI methodologies in the IPCC 2003 Good Practice Guidance (GPG2003)[6], and provides cross-references to the IPCC 2006 Guidelines[7] in anticipation of some Parties wishing to refer to these. Use of IPCC guidance and guidelines is necessary, but not specific on how to ensure consistency between REDD+ estimates and national GHGIs. Moreover, technical implementers may differ in the way they use Tiers, Approaches and numerical data provided by IPCC or estimated nationally. Consistency can be enhanced if:

1) the definition[8] of *forest* agrees between REDD+ GHG estimates, FREL/FRLs, and GHGI
2) REDD+ activities are identifiable in the GHGI as IPCC categories, subcategories, or sums of categories or sub-categories. Table 1 in this module shows the relationship expected in the MGD between REDD+ activities, IPCC categories, and the sections of version 1 of the MGD

[5] The links to these documents are, in order: i) http://www.gofcgold.wur.nl/redd/sourcebook/GOFC-GOLD_Sourcebook.pdf, ii) http://www.un-redd.org/FRELPublication/tabid/794487/Default.aspx, iii) http://www.unredd.net/index.php?view=document&alias=14118-technical-considerations-for-forest-reference-emission-level-andor-forest-reference-level-construction-for-redd-under-the-unfccc&category_slug=frl&layout=default&option=com_docman&Itemid=134 and iv) https://www.forestcarbonpartnership.org/carbon-fund-methodological-framework

[6] http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_contents.html

[7] http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

[8] Including also on how managed forests are defined

which provide advice on emissions and removals estimation. Stratification of land categories in subdivisions may help to increase transparency to assess consistency if the REDD+ activity does not correspond to the whole inventory category, e.g. because of a distinction between degradation and sustainable management, where sustainable management does not cover the entire managed forests, or because of interim use of sub-national FREL/FRLs. If deforestation area does not take account of any regrowth or replanting after clear-cutting, it sometimes being called *gross deforestation* in the REDD+ context. This terminology is not fully consistent with the IPCC definition of forest land which includes systems where there is the potential to regain forest thresholds. *Gross deforestation* can also mean area deforested without taking account of increases in forest area from land converted to forest. Although in practice the differences may be small (because forest cover loss through clear cut is often linked to land use change in the REDD+ context), a clear description of what is included in the FREL/FRL is needed and there may be some need for reconciliation between categories used in the GHGI.

3) activity data and emission factors (or related quantities such as carbon densities) agree between REDD+ and the GHGI. If differences exist, any explanation on the reasons, rationale and impact of the differences would enhance the transparency. This may require sub-division if REDD+ categories do not correspond to whole inventory categories.
4) REDD+ activities are part of the system of land representation described in Chapter 2 of the GPG2003 (or Chapter 3 of volume 4 of the IPCC 2006 Guidelines) with the sum over land uses adding up to the national land area.

If estimates are made for sub-national forest areas, emission factors used should either be consistent with the values used in national inventories, or Parties should consider whether there is a need to achieve consistency, perhaps by increasing stratification in the GHGI. This could be done at the iteration and cross-checking stage of the process set out in the decision tree – see the fig. 1 box identified by note (b).

Consistency between REDD+ estimates and the GHGI does not necessarily imply that the coverage of pools and gases is identical. This is because *significant pools* may mean different things in the REDD+ and the GHGI contexts (see §2.5), and because the stepwise approach (see §2.6) is not part of the GHGI, and because of the different objectives of both exercises – the GHGI is about estimating emissions and removals consistent with *good practice* whereas REDD+ is about effectively incentivizing actions to mitigate GHG associated with REDD+ activities. If differences exist in the coverage of pools and gases between the FREL/FRL and the GHGI, explanation concerning the reasons, rationale and impact of the differences would enhance the transparency.

The decision tree in fig. 1 (next page) shows how institutions can interact to achieve consistency.

Table 1 – Correspondence between REDD+ activities and IPCC categories in which they occur, and MGD section where advice on estimation is provided

REDD+	IPCC	MGD Advice
Reducing emissions from deforestation[9]	Forest land converted to land uses other than forest	2.2.1
Reducing emissions from forest degradation	Forest remaining forest	2.2.2
Conservation of forest carbon stocks	Forest remaining forest	2.2.3, 2.2.4
Sustainable management of forests	Forest remaining forest	2.2.3, 2.2.4
Enhancement of forest carbon stocks (within an existing forest)	Forest remaining forest	2.2.3, 2.2.4
Enhancement of forest carbon stocks (afforestation of land not previously forest, reforestation of land previously converted from another land use)	Other land uses converted to forest land	2.2.5, 2.2.6

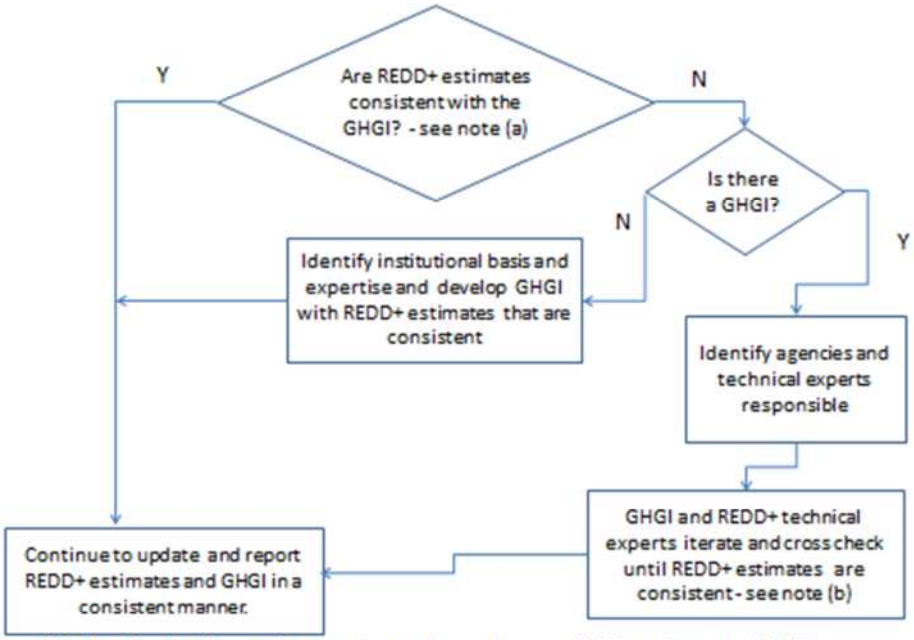

Fig 1 Institutional Process for ensuring consistency between REDD+ estimates and GHGI
Notes: (a) See § 2.1 on achieving consistency. (b) This is the box is referred to at the end of the second paragraph of § 2.1.

[9] Emissions from "gross deforestation" defined by clear cutting may be greater than those from deforestation considered in the IPCC inventory methodology because gross deforestation does not take account of forest regrowth or replanting after the clear-cutting. See also point 2 in the list at the start of this sub-section.

2.2 *Use of historical data*

Although GHGIs are not necessarily produced every year, with consistency with the GHGI established, the historical data used to estimate FREL/FRLs need not be restricted to years for which GHGIs are available, so long as relevant time series are internally consistent. Averaging historical time series can be used to establish representative historical levels of emissions and removals and also help in understanding the effect of drivers on emissions and removals associated with REDD+ activities. Although the UNFCCC does not specify a period, ten to fifteen years could be considered a feasible and useful period for time series. The Landsat archive provides data from which time series for GHG emissions and removals associated with REDD+ activities can be derived, especially for deforestation[10], using the methods set out in section 2.2 of the MGD. Historical Landsat data are freely available as a core data set (see MGD section 3.4 and Annex B) and can be accessed via the USGS Data Centre[11].

Although (compared with national mapping) additional processing is likely to be required to make estimates consistent with the national forest definition, and additional reference data points may be needed to achieve the desired precision, Parties may wish to consider use of the global maps of tree cover and tree cover change, such as those provided by the University of Maryland (UMD) which are derived from Landsat and go back to 2000[12]. Use of the UMD data may help make progress before national mapping capacity is fully established. The trade-offs between national mapping and the use of global datasets are set out in a separate module[13].

Once established, time series can be extended and/or revised as new data become available and the information incorporated into updated reference levels. Table 2 describes some different types of reference level consistent with COP decisions and fig. 2 suggests a decision tree for choosing between them. The most appropriate form of FREL/FRL may change over time; for example as understanding of drivers improves a Party could move from historical types to linear or other projections. Also the most appropriate form of reference level may vary with REDD+ activity, depending on the type of historical data available.

[10] As indicated in the MGD, higher resolution data may be needed for degradation and other activities.

[11] See http://landsat.usgs.gov The GFOI continuing to work to ensure the long term availability of space data www.gfoi.org/space-data/ .

[12] The UMD data are available through the WRI Global Forest Watch web-site http://www.globalforestwatch.org/ and can also be accessed at https://earthengine.google.org/ (http://earthenginepartners.appspot.com/science-2013-global-forest)

[13] http://www.gfoi.org/wp-content/uploads/2015/03/MGDModule2_Use-of-Global-Data-Sets.pdf

Table 2 Different types of reference level

Type of reference level	Description	Notes
(1) Historical average	Average emissions or removals, generally over a defined period (10-15 years could be considered useful)	Simplest option; assesses achievement of REDD+ actions relative to a fixed historical period. The fixed period used could be updated periodically.
(2) Rolling average	As 1 but updated, probably every 5 years with the averaging period kept at the same duration but shifted accordingly	The historical period lags the period used for assessment by 10 years or so. Gives closer tracking between REDD+ activities and the FREL/FRL than (1).
(3) Cumulative average (also called dynamic average)	As (1) but newly available historical data extends the averaging period	Approaches the current value more slowly than (2). Re-calibration every 15 years or so could be useful, consistent with the range considered for simple historical averages.
(4) Trend extrapolation	Extrapolation of trend fitted to historical data	Needs good confidence that the past trend is likely to be representative of the future. Otherwise needs frequent updating. The trend fitted could be linear or some other function (e.g. logarithmic) if this gave better representation.
(5) Other projection	Projection based on model simulation	Needs good understanding of the effect of drivers (based on historical data) and policies, and solid basis and documentation of the assumptions made. For credibility, models used for the projection should be transparent and able to replicate past levels and trends[14], possibly including expectations underlying the forest transition curve.

[14] Transparency in models is discussed in the report of *the IPCC Expert Meeting on Use of Models and Measurements in GHG Inventories* (Sydney 2010), available at http://www.ipcc-nggip.iges.or.jp/meeting/meeting.html

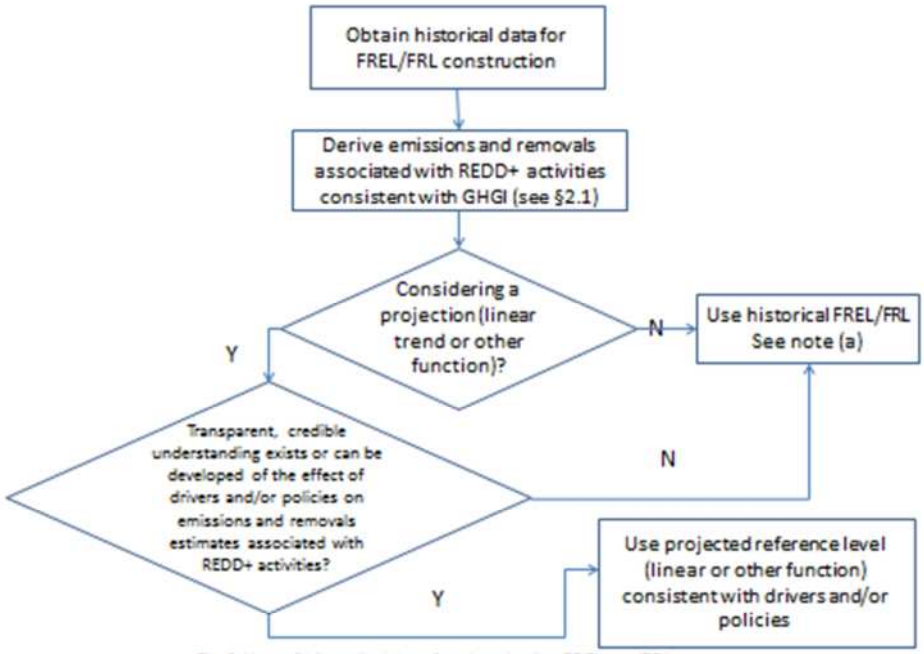

Fig 2 Use of historical data for developing FRELs or FRLs
Note (a) Historical levels include historical average, rolling means and cumulative means

2.3 Uncertainties and conservativeness

The COP decisions that make up the Warsaw Framework on REDD+ refer explicitly neither to uncertainties nor to conservativeness, although use of IPCC guidance to quantify emissions and removals does of course require quantification of uncertainties consistent with the good practice principle of *neither over- nor under-estimates so far as can be judged, and uncertainties reduced so far as is practicable*. Other frameworks do refer explicitly to these concepts, e.g. the World Bank FCPF Methodological Framework has a table of conservativeness factors linked to uncertainties in emissions reductions.

Uncertainties in annual emissions or removals associated with REDD+ activities can be estimated using the methods outlined in the MGD, which is consistent with IPCC Guidance[15]. In assessing performance in implementing REDD+ activities (e.g. deforestation) the comparison is between the FREL and an assessment period. To the extent that each estimate is independent, one can assume that the uncertainties associated with successive estimates of areas deforested are uncorrelated. On the other hand for emission factors (carbon densities) to estimate emissions, the errors are correlated, because the same set of plots is likely to be used to establish the carbon densities used in successive calculations. As consequence to estimate the overall uncertainty in emissions reduction it makes sense firstly to estimate the overall effect of the (uncorrelated) activity data uncertainties, and only then combine the result with the (correlated) emission factor uncertainties to get the overall uncertainty on emission reduction. Box 1 sets out how this may be done in a simple case.

[15] See MGD version 1 §§ 3.7 and 4, also GPG2000 §6.3 or vol 1 of the2006 IPCC Guidelines, § 3.2.3.1.

BOX 1 Uncertainty analysis to compare a FREL with deforestation emissions during an assessment period

Suppose that to establish the FREL, a number N successive determinations of deforested area were made and that these had values A_i ha/yr (i=1…N), and that using the methods outlined in section 3.7 of the MGD, the uncertainty of each determination was estimated to be U_{Ai} ha/yr corresponding to the 95% confidence interval. In this case, for the FREL the annual area deforested averaged over the N determinations is $A = (\Sigma A_i)/N$ and the corresponding uncertainty is $U_A = (\sqrt{\Sigma U^2_{Ai}})/N$ ha per year; in other words the annual area deforested over the period used to establish the FREL is estimated to be $A \pm U_A$ ha/yr with 95% confidence.

Similarly if during the assessment period, M successive determinations of the deforestation rate are made with values B_j ha/yr (j=1…M), each determination having an uncertainty of U_{Bj} ha/yr estimated using the methods set out in section 3.7 of MGD version 1, the average annual deforestation rate during the assessment period is $B = (\Sigma B_j)/M$ and the corresponding uncertainty is $U_B = (\sqrt{\Sigma U^2_{Bj}})/M$ ha per year; in summary during the assessment period the average deforestation rate is estimated to be $B \pm U_B$ ha/yr with 95% confidence.

Comparing the FREL and the assessment period, the fall in annual average deforestation rate is (A-B) ha per year, with an uncertainty of $\sqrt{(U^2_A + U^2_B)}$ ha/yr. Say (A-B) = R where R is the reduction in annual deforested area between the FREL and the assessment period. Then percentage uncertainty in R is $100 \times \sqrt{(U^2_A + U^2_B)}/R$. It is necessary to use the percentage uncertainty for the next step in the calculation since emission factors are multiplied by activity data to produce emissions estimates.

Now suppose that the emission factor (the carbon density per unit area) is E with an uncertainty of U_E at the 95% confidence interval expressed as carbon per unit area. Then the percentage uncertainty in E is $100 \times U_E/E$.

Finally the reduction in emissions achieved between the FREL and the assessment period is $(44/12) \times E \times (A-B)$ with a percentage uncertainty of $100 \times \sqrt{(U^2_E/E^2 + (U^2_A + U^2_B) /R^2)}$. This result is approximate because the rule for using percentage uncertainties to propagate uncertainties under multiplication is approximate. Because of this, if percentage uncertainties much exceed 30% better results are obtainable if uncertainties are combined using stochastic simulation (often called Monte Carlo analysis). This approach will be necessary if R is close to zero (which will occur if there is no reduction in deforestation rate), because *percentage* uncertainties in R can then become very large, or incalculable if R=0. Stochastic simulation also enables dynamics and linkages between carbon pools to be represented in uncertainty analysis. Procedures for Monte Carlo analysis are described in GPG2003 §5.2.2.2 (or §3.2.3.2 in chapter 3, vol 1 of the 2006GL). The factor 44/12 converts estimates made using carbon densities to carbon dioxide emissions.

2.4 Adjustments

Under some conditions, historical data could be unrepresentative of what would happen in the absence of REDD+ activities, and therefore less useful as a benchmark for assessing performance. For example, this could be the case in a Party with high forest area and low deforestation rate facing new pressures to deforest or to degrade forest ecosystems. If the effect of the altered circumstances can be quantified, the FREL/FRL may be adjusted. The decision tree (fig 3) suggests a framework for assessing when this could be the case.

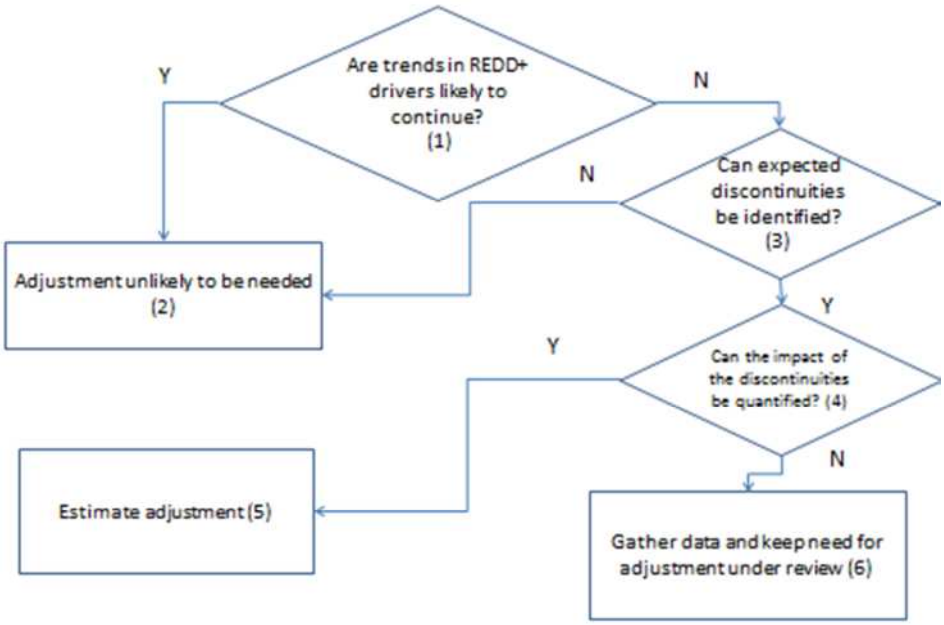

Fig 3 Decision tree for considering adjustments – see text for further discussions

In the decision tree, box 1 suggests that continuation of existing trends in drivers is unlikely to give rise to the need for an adjustment (box 2), because these trends are what has driven past emissions and removals from REDD+ activities and unless there is a discontinuity of some sort this will probably continue. Of course the relationship between drivers may evolve over time, but this effect can be captured by the updating of the FREL, without requiring an adjustment. If *discontinuities* from past trends (box 3) are expected, an adjustment may be justified - for example there may be extensive new infrastructure or other new developments in forest areas, or other changes likely to affect human impacts on forests. In order to quantify the effect associated, discontinuities need first to be identified (box 3) and then quantified (box 4). Quantification could be done by direct estimation of the effect of the discontinuity (new infrastructure development etc. beyond past trends) or by more sophisticated modelling, though as noted in the context of FREL/FRL type 5 (see Table 2) the uncertainties in model estimates of this kind are likely to be large, and models that are calibrated to past conditions may not perform well if discontinuous changes are expected due to variables or factors not included in the model. It may be useful to compare the adjusted FREL/FRL with other countries in the region and (in the case of adjusted deforestation rates at least) with regional or global rates since these represent the range of pressures to which forests are exposed, and adjustments in excess of these rates would seem inconsistent with the purpose of REDD+.

2.5 Significant pools and activities

Decisions 12/CP.17 and 13/CP.19 indicate that *significant* pools and activities should be included in FREL/FRLs, and that Parties have some flexibility not to include other pools and activities, considered not to be significant. From a methodological perspective, for reasons of consistency, it is clear that inclusion of pools and activities should be the same in the FREL/FRL as for the subsequent emissions and removals estimates used to estimate the effects of implementing REDD+ activities.

Drawing on a precedent from IPCC usage, the MGD[16] suggests that *significant* pools could be those accounting for 25% to 30% or more of the GHG emissions or removals associated with a REDD+ activity[17]. The analogy is not exact because IPCC uses the 25% to 30% level to define as *significan*t pools for which default methodologies can be applied, even if the category to which they belong is a key category. This is not the same as deciding on potential flexibility to omit a pool. Therefore it seems useful to consider another (though not necessarily mutually exclusive) way to approach significance, based on a set of rules intended to ensure conservativeness (i.e. that achievement in emissions reductions or removals enhancement would not be overestimated) and prioritizing of the most relevant sources. For example:

A. the pool likely to be responsible for the largest emissions addressed by the REDD+ activity (or removals if the carbon stocks addressed by the activity are increasing) is considered the most *significant*
B. other pools can potentially be considered *not significant* (in the sense that their exclusion is conservative) if they behave in the same way as the most significant pool (i.e. their carbon stocks increase or decrease when those from the initial significant pool increase or decrease, respectively)
C. on the other hand, pools expected to behave differently compared with the most significant pool are considered potentially *significant,* for inclusion at the same time as the most significant pool, or for prioritization in a stepwise approach as better data become available (see §2.5).

For deforestation in tropical biomes, the most significant pool will often be biomass. In the case of other activities, biomass could be regarded initially as the most significant pool and the other pools tested against this working hypothesis using IPCC methods summarized in the MGD, implemented at Tier 1 for test purposes. As an example, where covered by national forest definitions, for planted forests established on drained organic soils, soil organic carbon is very likely to be significant under the rules suggested above because the pool decreases as biomass increases. The expectation would be to include significant pools using country specific data (hence Tier 2), as these become available. Significance can be kept under review as national monitoring systems develop.

As with pools, for activities a possible consideration could be that the REDD+ activity likely to be responsible for the largest GHG emissions or removals be considered the most *significant*. Activities unlikely to be affected by displacement (causing greater emissions and/or reduced removals) due to action on the most significant activity could be considered *not significant* relative to the most significant activity. Activities likely to be affected by displacement due to action on the most significant activity would be considered potentially *significant,* for inclusion at the same time as the most significant activity, or for prioritization in a stepwise approach as better data become available (see §2.5). Evidence for displacement[18] would include consideration of how action on the most

[16] See MGD page 42, footnote 48.
[17] Other percentage levels could be used to define *significant* are possible; e.g. the FCPF Methodological Framework uses 10%.
[18] Noting that, according to Dec 9/CP.19, paragraph 4, countries should provide the most recent summary of information on how all of the safeguards (as referred to in decision 1/CP.16, appendix I, paragraph 2), including actions to reduce displacement of emissions, have been addressed and respected before they can receive results-based payments.

significant activity would affect the drivers of other activities, and hence the emissions and/or removals associated with them. The relationship to proxies may be relevant. Subsequent steps would also allow inclusion of the next largest activities whether or not affected by displacement from activities already included as *significant*. This process could continue until all activities justified as significant by the Party and considered under the TA process were included.

The relative importance of emissions or removals associated with REDD+ activities may change over time (because of actions taken or the evolution of drivers), so significance, where applied, should be reassessed periodically, e.g. as part of a stepwise approach, and in particular when assessing results.

2.6 Stepwise approach and updating

Under a stepwise approach[19] FREL/FRLs may be improved by better data or methodologies, and additional pools can be added over time. If the provision for inclusion of better data is interpreted as allowing for this, Parties using a stepwise approach could start with the activity considered to be the most significant and include all significant pools associated with it, as indicated by criteria A to C above. This should ensure conservativeness and prioritization of the most relevant sources. Subsequent steps would add other significant activities – e.g. forest degradation, which is likely to become easier to monitor in the foreseeable future through increased availability of high resolution data and other types of remote sensing (see MGD Section 3.2). Future improvements in data could also involve establishment of national forest inventories, for improved forest policies and resource management, and improved reporting capabilities, including for REDD+.

A stepwise approach as a way to incorporate additional pools and activities is related to the more general requirement for Parties to update FREL/FRLs *periodically as appropriate, taking into account new knowledge, new trends and any modification of scope and methodologies*[20]. When updating, Parties should maintain methodological consistency between the REDD+ GHG estimates and the FREL/FRLs. Similar considerations would apply to other types of FREL/FRL, if identified. This will help ensure a smooth transition and avoid discontinuities related to the data used, rather than to the underlying realities.

2.7 Number of reference levels per Party

Annexes to Decisions 12/CP.17 and 13/CP.19[21] refer to …[a Party's]… *forest reference emission level and/or forest reference level* . In the case of national FREL/FRLs, the simplest approach could be that each Party may decide to have at most one FREL and/or one FRL, and these could be added to produce just one FREL/FRL, which would be the sum of all REDD+ activities included by the Party. This would be regarded as either a FREL or a FRL depending on the sign of the outcome. Having one FREL and/or FRL could help increase methodological consistency, reduce monitoring costs and uncertainties, and reduce the risk of displacement.

In developing the FREL and/or the FRL, the GHG emissions and removals associated with REDD+ activities may be estimated using IPCC methodologies as summarized in section 2.2.1 to 2.2.5 of the MGD. Activities associated with long term reduction in carbon stocks (i.e. deforestation and forest

[19] See paragraph 10 of 12/CP.17
[20] See paragraph 12 of 12/CP.17
[21] 12/CP.17 and 13/CP19 are respectively the decisions on reference level submission and its technical assessment from the Durban and Warsaw COPs

degradation) would be included in the FREL, and the other activities included in the FRL. Short-term emissions (e.g. due to harvest prior to replanting) may occur in the other activities but this should not cause switching of the activity between the FREL and the FRL, because this would introduce time series inconsistency and distort the use of FREL/FRLs as performance benchmarks. The MGD points out the possibility that, when other forest values are taken into account, long term reduction in carbon stocks could be associated with sustainable forest management, and this could in principle lead to inclusion in the FREL of sustainable management of forests. In this case also there should not be switching of activities back and forth between the FREL and the FRL. Changes of activity coverage should be accompanied by re-assessment of the FREL and FRL.

2.8 Sub-national activities

Subnational FREL/FRLs may be elaborated as an interim step on the way to development of national FREL/FRLs[22], and in this case development of national forest monitoring systems should …*include monitoring and reporting of emissions displacement at the national level, if appropriate, and reporting on how displacement of emissions is being addressed, and on the means to integrate subnational monitoring systems into a national monitoring system*[23].

For integration into national monitoring systems, it will help if the boundaries of sub-national activities and hence their associated FRELs and FRLs correspond to boundaries in the stratification process of the national GHG inventory since this will help deliver consistency with the GHGI, as discussed in §2.1.

If the national FREL/FRL already exists as a sum of sub-national FREL/FRLs[24] then estimates of displaced emissions will be unnecessary for international reporting. Otherwise evidence, to establish whether there is a zone of influence outside the boundary of the sub-national FREL/FRL and support estimates of displaced emissions, could be gathered by remote sensing to detect signs of disturbance, or by ground sampling. Stratification of activities at the national or sub-national scale may also be useful to identify areas associated with drivers and to demonstrate the effect of actions taken.

[22] See paragraph 11, Decision 12/CP.17
[23] See paragraph 71(c), footnote 7 of Decision 1/CP.16
[24] This possibility is recognised in paragraph 71(b), footnote 6 of Decision 1/CP.16

ANNEX 1

Summary of Technical Assessment of FREL/FRLs

FREL/FRLs submitted shall be subject to a TA, possibly in the context of results-based payments (decision 13/CP.19, paragraphs 1 and 2). Details of the TA are given in the annex of the same decision. The TA of the FREL/FRL must be completed before Parties can submit their REDD+ results through a technical annex to the BUR. This technical annex to the BUR is then subject to a separate and subsequent technical analysis.

The objectives of the TA of FREL/FRLs are a) to assess the degree to which information provided by Parties is in accordance with the guidelines for submissions of information on FREL/FRLs contained in the annex to decision 12/CP.17; and b) to offer a facilitative, non-intrusive, technical exchange of information on the construction of FREL/FRLs with a view to supporting the capacity of developing country Parties for the construction and future improvements, as appropriate, of their FREL/FRLs, subject to national capabilities and policy.

The scope of the TA of FREL/FRLs, as defined in the Annex to decision 13/CP.19, covers elements that Parties should present in their FREL/FRL, in summary transparent, complete[25], consistent and accurate information on:

- the data, approaches, methods, models (if applicable) and assumptions used in the construction of the FREL/FRL
- consistency with corresponding anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks between the FREL/FRL and the national greenhouse gas inventory;
- how historical data have been taken into account in the establishment of the FREL/FRL;
- relevant policies and plans, as appropriate;
- changes to any previously submitted FREL/FRL taking into account the stepwise approach;
- pools and gases, and activities included in the FREL/FRL, and justification of why omitted pools and/or activities were deemed not significant;
- the definition of forest used, and why and how the definition used was chosen;
- coverage of the forest area (i.e. national or less than the entire forest area)
- assumptions about future changes to domestic policies have been included in the construction of the FREL/FRL.

Summary of information to be provided as technical annex of the BURs

Decision 14/CP.19 stipulates that data and information used by Parties in estimating REDD+ activities, should be transparent, consistent over time, and take account of previous relevant Decisions[26]. Data and information should be provided through BURs, and that parties seeking results-based payments are requested to provide a technical annex for which guidelines are provided. So far as the FREL/FRL is concerned, these guidelines request information on the:

[25] Complete here means the provision of information that allows for the reconstruction of the forest reference emission levels and/or forest reference levels.

[26] There is cross-reference to paragraph 71(c) of 1/CP.16 which requires robust and transparent national forest monitoring systems to include monitoring of displacement in the case of sub-national FREL/FRLs as an interim measure, and to report on how sub-national monitoring systems are being integrated into national monitoring systems.

- assessed FREL/FRL expressed in tonnes CO_2-eq per yr, its date of submission and the date of the final TA
- period and territorial area covered by the FREL/FRL
- activity or activities included in the FREL/FRL
- demonstration of consistency between results expressed in tonnes CO_2-eq per yr and the FREL/FRL
- demonstration of methodological consistency between the results and the FREL/FRL
- Description of national forest monitoring system and the institutional roles for measuring reporting and verifying the results
- Information that allows reconstruction of results.

Under the general provisions for BURs this information will be assessed by a team of technical experts which may include, at the request of developing Parties seeking results-based payments, experts on land use, land use change and forestry. The experts will analyse the extent to which:

(a) there is consistency in methodologies, definitions, comprehensiveness and the information provided between the assessed reference level and the results of the implementation of the REDD+ activities

(b) data and information provided in the technical annex are transparent, consistent, complete and accurate

(c) data and information provided in the technical annex is consistent with the guidelines summarized above so far as FREL/FRLs are concerned

(d) results are accurate, to the extent possible.

Annex 2 List of Abbreviations

Abbreviation	Meaning
BUR	Biennial Update Report
COP	Conference of Parties
FCPF	Forest Carbon Partnership Facility
FREL, FRL, FREL/FRL	Forest Reference Emissions Level, Forest Reference Level, Forest Reference Emissions Level or Forest reference Level
GFOI	Global Forest Observations Initiative
GHG, GHGI	Greenhouse Gases, Greenhouse Gas Inventory
GOFC-GOLD	Global Observation of Forest and Land Cover Dynamics
GPG2003; 2006GL	IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry; 2006 IPCC Guidelines for Greenhouse Gas Inventories
IPCC	Intergovernmental Panel on Climate Change
MGD	Methods and Guidance Document
MRV	Measurement, Reporting and Verification
REDD+	Reducing Emissions from Deforestation, Reducing Emissions from Forest Degradation, Conservation of Forest Carbon Stocks, Sustainable Management of Forests, and Enhancement of Forest Carbon Stocks
TA	Technical Assessment
UNFCCC	United Nations Framework Convention on Climate Change
UMD	University of Maryland
UN-REDD	United Nations collaborative initiative on Reducing Emissions from Deforestation and Forest Degradation.
USGS	U.S. Geological Survey
WRI	World Resources Institute

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[27] The final text represents the views of the authors, taking review comments into account.