Guidance Note for accounting of legacy emissions/removals

March 2021

Version 1

1 Background of issues

1. In REDD+, reference levels serve as benchmarks for assessing performance in implementing REDD+ activities. Reference levels are expressed as tonnes of CO2 equivalent per year for a reference period against which the emissions and removals from a results period will be compared. In the context of the Forest Carbon Partnership Facility (FCPF), the FCPF Methodological Framework provides criteria and indicators for the development of Emission Reductions (ER) Program, including the development of Reference Levels.

2. After a review of all Emission Reductions Program Documents (ERPDs) it is clear that different ER Programs have different approaches for incorporating changes in emissions and removals from REDD+ Activities and Carbon Pools that take place over a longer time period (for example emissions and removals from changes to the Soil Organic Carbon Pool and removals from afforestation/reforestation). At least three different approaches have been followed to set the Reference Level for Soil Organic Carbon pool (including peatland) and four approaches have been used to set the Reference Level for removals from afforestation/reforestation with different implications in terms of overestimation/ underestimation of emissions/removals.

3. In view of this, it is necessary to define some good practice guidance to enable countries to account for these pools in a consistent manner. A possible starting point for identifying some common rules are the most recent [1] Intergovernmental Panel on Climate Change (IPCC) guidance and guidelines. However, these guidelines are developed to enable the compilation of repeated national inventories and not necessarily for the comparison of emissions against a Reference Level as is required for result-based payments under REDD+. One area where this becomes clear is emissions and removals that take place over a longer time period.

4. In the IPCC guidelines, after a change in land use, it is good practice to assume is that the carbons stocks in the relevant area change from one steady value (associated with the land use before the land use change) to another steady value (associated with the land use after the land use change) over a period of at least 20 years with the emissions and removals being spread over the whole transition period. This means that in a particular year, GHG emission and removals associated with land use are not just the result of the land use changes occurring in that year but also of emission and removals resulting from land use changes that occurred in previous years (for the purpose of this guidance we will refer to these emissions and removals resulting from land use changes in previous years as **"legacy emissions/removals"**). Using this assumption for REDD+ has important consequences for the estimation of the emission reductions:

    - The emissions and removals occurring during the reference period and the result period would not just be the result of the land use changes occurring during the reference period and the result period but would also include legacy emissions and removals of land use changes that occurred outside these two periods of interest. This therefore affects the idea that reference levels serve as benchmarks based on the performance in implementing REDD+ activities during the reference period;

5. Full implementation of the IPCC guidelines would require long time series of data (going back at least 20 years before the start of the reference period) to properly estimate legacy emissions/removals. A lack of historical data in developing countries makes the quantification of legacy emissions/removals challenging

6. It has become clear that different interpretations exist of how the IPCC guidelines shall be applied to legacy emissions and removals in the context of REDD+, and existing guidance such as the Methodology and Guidance Document of the Global Forest Observation Initiative (GFOI) does not provide an adequate solution under an accounting framework. The purpose of this note is therefore to provide guidance to REDD Countries

[1] In the context of the FCPF Carbon Fund, this most recent guidance and guidelines is interpreted as referring to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and the 2019 Refinement to the 2006 IPCC Guidelines.

and other users of the FCPF Methodological Framework on **acceptable** methods for accounting for legacy emissions and removals in the context of the FCPF Carbon Fund.

2 Scope of this guidance

7. This guidance is applicable to the application of the FCPF Methodological Framework only. This guidance applies to the following REDD+ Activities, Pools and Gases:

   a) Changes in the Soil Organic Carbon pool in mineral soils associated with deforestation
   b) Land converted to forest land
   c) Emissions from organic soils associated to drainage of degraded forestland and deforested land

8. These approaches may be applied by REDD countries to their reference level without requiring prior approval from Carbon Fund Participants as indicated in the Guidelines on the Application of the MF Number 2 'Guidelines on technical corrections'. Following such guidelines, other changes that do not relate to the accounting approach and are not included in the positive list of the Guidelines shall not constitute technical corrections and the REDD Country shall request prior-approval from Carbon Fund Participants for its use in the RL.

3 General approach

9. The general approach is based on the following principles:

   a) Calculation of the emission reductions shall be based on comparing the emission and removals associated with the land use changes in the reference period and the result period only, including the legacy emissions/removals from the land use changes in these two periods. It is not necessary to have a longer time series of data to estimate legacy emissions and removals from land use changes before these two periods.
   b) Calculation of emission reductions shall consider the transition periods from the IPCC and the associated annual carbon stock changes.
   c) Determination of the Reference Level shall assume that the average annual rate of change (e.g. deforestation expressed in ha/yr) during the Reference Period would have applied during the Crediting Period and emission and removals are calculated accordingly.
   d) Indicator 14.3 of the FCPF Methodological Framework requires that IPCC Tier 2 or higher methods are used to establish emission factors. The approaches in this note are based on an assumption of Tier 2. ER Programs may use Tier 3 approaches (such as advanced modelling) but in those situations the consideration of legacy emissions shall be considered on a case-by-case basis and are not covered by this guidance note so they are subject to the provisions of FCPF Guideline number 2.

4 Specific approach for REDD+ Activities, Pools and Gases

4.1 Changes in the Soil Organic Carbon pool in mineral soils associated with deforestation:

10. In addition to the general approach provided below, ER Programs shall consider the guidance provided below (including guidance provided in box 1 in the form of an example) when estimating changes in the Soil Organic Carbon pool in mineral soils associated with deforestation:

    a) The Soil Organic Carbon (SOC) pool in forests shall be assumed to be in equilibrium at the beginning of the Reference Period.

b) The assumed equilibrium following deforestation shall be conservatively determined and justified based on the expected deforestation land use. In this context, conservative means that the assumed equilibrium shall not overestimate the emissions associated with deforestation. It shall be assumed that the Soil organic C stock change during the transition to a new equilibrium SOC occurs in a linear fashion over a period of 20 years.

c) With Tier 2, ER Programs shall apply Equation 2.25 from the 2006 IPCC Guidelines, Volume 4, Chapter 2. Since the Methodological Framework requires IPCC Approach 3 for Activity Data collection for deforestation, formulation B from box 2.1 of that same chapter will be applied.

d) The land units used in the equation will represent the different classes from the land use change analysis and the different inventory periods used in setting the reference level and for monitoring. For example, if the deforestation in the Reference Period was analyzed using different smaller time periods (for example to determine deforestation from 2005-2015, land use changes were analyzed for the periods 2005-2010, 2011-2012 and 2013-2015), deforestation in each time period would be a separate land unit. For the monitoring period, separate land units shall be created for deforestation in each year of the monitoring period (see example in box 1 below).

e) In defining the land use units, countries shall maintain the same classes/definitions as the ones used in the land use change analysis provided in their ER-PD[2].

BOX 1: Example calculation of changes in the Soil Organic Carbon pool in mineral soils associated with deforestation:

This example is based on box 2.2 from the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 2 for the estimation of SOC emissions from deforestation under the FCPF Methodological Framework

This simplified example shows the basis for setting reference levels and estimating emissions from changes in the SOC resulting from deforestation. This simplified example is using the following assumptions:

- The country has a single soil type, with a SOC_{Ref} value of 77 tonnes C ha^{-1} corresponding to forest vegetation.
- It is assumed that the SOC_{Ref} value for post-deforestation land use is 67 tonnes C ha^{-1}. , It is assumed that the Soil organic C stock change during the transition to a new equilibrium SOC occurs in a linear fashion over a period of 20 years (0.5 t C ha^{-1} $year^{-1}$).
- At the start of the Reference Period the total forest area is 1,000,000 ha.
- There is a 10-year Reference Period (2006-2015). The average deforestation in the reference period is 8,000 ha/year.
- The deforestation in the period 2016-2018 is available and is 21,000 ha (so on average 7,000 ha/year).
- The first monitoring period is 2019-2020 during which 12,000 ha were deforested.
- The second monitoring period is 2021-2022. In this period also 12,000 ha were deforested.

In accordance with the approach provided in the 2006 IPCC Guidelines and following the guidance above, the example above leads to the following land use change matrix for determining the Reference level for emissions

[2] Changes in the land use / land cover classification system are changes to policy design decisions which are not acceptable technical corrections and shall require prior approval from the FCPF as described in the Guidelines on the application of the Methodological Framework No. 2.

from SOC. In accordance with the guidance, it is assumed that the average annual rate of deforestation during the Reference Period (8,000 ha/year) would have applied during the Crediting Period and separate land units are created for each year. The land units are based on the classes stable forest and deforestation with separate land units created for the different inventory periods.

		Ha of land use unit in:				
		2005	**2015**	**2018**	**2020**	**2022**
Land unit 1	**Deforestation during 2006-2015**	-	80,000	80,000	80,000	80,000
Land unit 2	**Deforestation during 2016-2018**	-	-	21,000	21,000	21,000
Land unit 3	**Reference level projected deforestation during 2019**	-	-	-	8,000	8,000
Land unit 4	**Reference level projected deforestation during 2020**	-	-	-	8,000	8,000
Land unit 5	**Reference level projected deforestation during 2021**	-	-	-	-	8,000
Land unit 6	**Reference level projected deforestation during 2022**	-	-	-	-	8,000
Land unit 7	**Stable forest**	1,000,000	920,000	899,000	883,000	867,000
Total area		**1,000,000**	**1,000,000**	**1,000,000**	**1,000,000**	**1,000,000**

Using the assumed changes in SOC over 20 years, the SOC value for each land unit in a particular year would be:

		SOC /ha of land use unit in:				
		2005	**2015**	**2018**	**2020**	**2022**
Land unit 1	**Deforestation during 2006-2015**	-	72	70.5	69.5	68.5
Land unit 2	**Deforestation during 2016-2018**	-	-	75.5	74.5	73.5
Land unit 3	**Deforestation during 2019**	-	-	-	76.0	75
Land unit 4	**Deforestation during 2020**	-	-	-	76.5	75.5
Land unit 5	**Deforestation during 2021**	-	-	-	-	76
Land unit 6	**Deforestation during 2022**	-	-	-	-	76.5
Land unit 7	**Stable forest**	77	77	77	77	77

Multiplying the two tables above leads to the following results for the application in Equation 2.25 to the Reference Level:

		SOC for land use unit in:				
		2005	**2015**	**2018**	**2020**	**2022**
Land unit 1	**Deforestation during 2006-2015**	-	5,760,000	5,640,000	5,560,000	5,480,000
Land unit 2	**Deforestation during 2016-2018**	-	-	1,585,500	1,564,500	1,543,500
Land unit 3	**Reference level projected deforestation during 2019**	-	-	-	608,000	600,000

Land unit 4	**Reference level projected deforestation during 2020**	-	-	-	612,000	604,000
Land unit 5	**Reference level projected deforestation during 2021**	-	-	-	-	608,000
Land unit 6	**Reference level projected deforestation during 2022**	-	-	-	-	612,000
Land unit 7	**Stable forest**	77,000,000	70,840,000	69,223,000	67,991,000	66,759,000
Total SOC		**77,000,000**	**76,600,000**	**76,448,500**	**76,335,500**	**76,206,500**

Applying the IPCC approach, changes in the Soil Organic Carbon pool are calculated as $SOC_0 - SOC_{(0-T)}$. This means that the changes in the Soil Organic Carbon pool associated with deforestation for the Reference Level of the first monitoring period (2019-2020), are '*total SOC* for 2020' (SOC_0) – '*total SOC* for 2018' ($SOC_{(0-T)}$) = 113,000 t C. For the second monitoring period (2021-2022), these are '*total SOC* for 2022' (SOC_0) – '*total SOC* for 2020' ($SOC_{(0-T)}$) = 129,000 t C.

For calculating the Emission Reductions, the changes in the Soil Organic Carbon pool under the Reference Level need to be compared with actual changes in the Soil Organic Carbon pool. In this example, the monitored deforestation during 2019-2020 and during 2021-2022 is 12,000 ha (6,000 ha/year). This results in the following land use change matrix which shows changes (in red) in land units 3,4, 5, 6 and 7 compared to the same matrix for the Reference Level.

		Ha of land use unit in:				
		2005	**2015**	**2018**	**2020**	**2022**
Land unit 1	**Deforestation during 2006-2015**	-	80,000	80,000	80,000	80,000
Land unit 2	**Deforestation during 2016-2018**	-	-	21,000	21,000	21,000
Land unit 3	**Actual deforestation during 2019**	-	-	-	6,000	6,000
Land unit 4	**Actual deforestation during 2020**	-	-	-	6,000	6,000
Land unit 5	**Actual deforestation during 2021**	-	-	-	-	6,000
Land unit 6	**Actual deforestation during 2022**	-	-	-	-	6,000
Land unit 7	**Stable forest**	1,000,000	920,000	899,000	887,000	875,000
Total area		**1,000,000**	**1,000,000**	**1,000,000**	**1,000,000**	**1,000,000**

Multiplying this with the table containing the SOC/ha values leads to the following results:

		SOC for land use unit in:				
		2005	**2015**	**2018**	**2020**	**2022**
Land unit 1	**Deforestation during 2006-2015**	-	5,760,000	5,640,000	5,560,000	5,480,000
Land unit 2	**Deforestation during 2016-2018**	-	-	1,585,500	1,564,500	1,543,500
Land unit 3	**Actual deforestation during 2019**	-	-	-	456,000	450,000
Land unit 4	**Actual deforestation during 2020**	-	-	-	459,000	453,000
Land unit 5	**Actual deforestation during 2021**	-	-	-	-	456,000

Land unit 6	**Actual deforestation during 2022**	-	-	-	-	459,000
Land unit 7	**Stable forest**	77,000,000	70,840,000	69,223,000	68,299,000	67,375,000
Total SOC		**77,000,000**	**76,600,000**	**76,448,500**	**76,338,500**	**76,216,500**

So the changes in the Soil Organic Carbon pool associated with the actual monitored deforestation in the first monitoring period (2019-2020), are '*total SOC* for 2020' (SOC_0) – '*total SOC* for 2018' ($SOC_{(0-T)}$) = 110,000 t C. For the second monitoring period (2021-2022) this is '*total SOC* for 2022' (SOC_0) – '*total SOC* for 2020' ($SOC_{(0-T)}$) = 122,000 t C.

The emission reductions from the SOC pool is calculated as the difference between the Reference Level and the monitored changes. For the first monitoring period (2018-2019) the difference between the changes in the Soil Organic in the Reference Level and the actual emissions is 113,000 – 110,000 = 3,000 t C (or 11,000 t CO_2). For the second monitoring period (2021-2022), this is 129,000 – 122,000 = 7,000 t C (or 25,667 t CO_2). The difference between the two periods is the result of the legacy emissions.

4.2 Land converted to forest land:

11. In the IPCC guidelines, land converted to forest land pertains to any conversion to forest from other land-uses, through afforestation and reforestation, either by natural or artificial regeneration (including plantations). ER Programs shall consider this section in the light of the definition of forest adopted by the country and the Cancun safeguards.

12. Programs shall apply section 4.3 from the 2006 IPCC Guidelines, Volume 4, Chapter 4 considering the general guidance provided below (including guidance provided in box 2 in the form of an example):

    a) Since the FCPF Methodological Framework requires IPCC Tier 2 or higher method, the net annual CO_2 removals shall be calculated using equations 2.15 and 2.16 from the 2006 IPCC Guidelines, Volume 4, Chapter 2. These equations shall be simplified by assuming that the conversion from non-forest to forest occurs during a period of time from average carbon stocks in non-forest to average carbon stocks in forests.

    b) ER Programs apply Indicator 14.2 and 14.3 of the FCPF Methodological Framework for determining the following parameters: i) average carbon stocks of forestland; and ii) average carbon stocks in non-forest land. Where applicable, stratification will be used to consider the impact of climate, biome or forest type, species mix, management practices, etc and create homogenous sub-categories.

    a) A conservative default period of 20 years is suggested for the forest to grow from the carbon stock levels of non-forest to the level of biomass, stable soil and litter pools of the average forest. Alternative periods may be used but shall be justified in Annex 4 to the ER-MR.

    c) ER Programs shall always consider changes in carbon stocks in above- and below-ground biomass. Changes in carbon stocks in dead organic matter (dead wood and litter) and changes in carbon stocks in soils shall be considered based on Indicator 4.2 of the FCPF Methodological Framework. If SOC in mineral soils is included, ER Programs shall follow the approach described in the section above by including the land converted to forest as separate land units.

    d) Following equation 2.16 from the IPCC Guidelines, ER Programs shall track the area converted to forest land in a certain year ($\Delta A_{TO\_OTHERSi}$) using an IPCC Approach 3 during the reference period and during the

crediting period (i.e. since the start of the first monitoring period to the end of the applicable monitoring/reporting period).

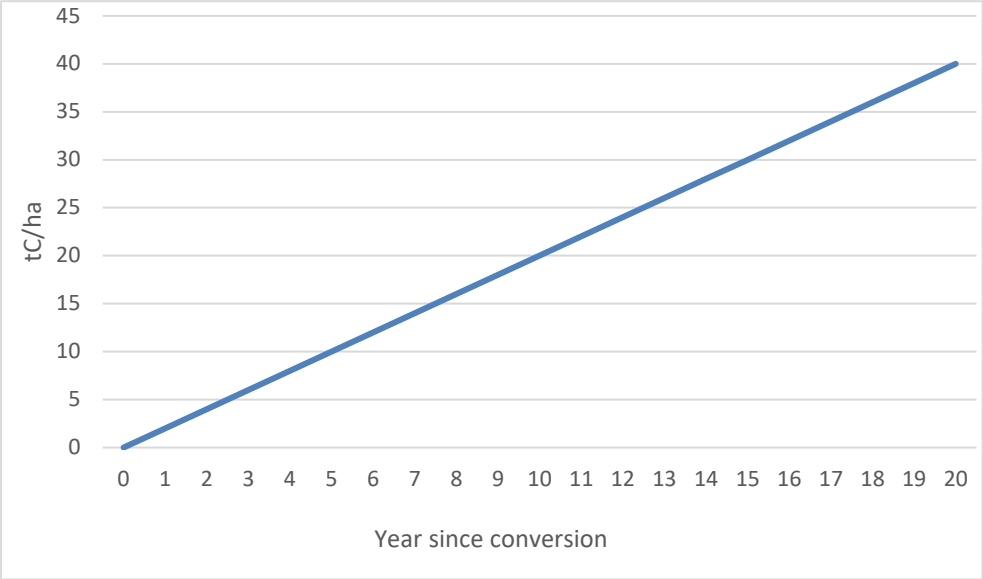
e) Using the outcome of equation 2.15 and 2.16, the ER Program shall determine the changes in the total carbon stocks in biomass (removals) during a monitoring period as the sum of the total carbon stocks in biomass of all land units. In line with Para. 3 c), it shall be assumed that the average annual rate of conversion to forest land during the Reference Period would have applied during the Crediting Period. The emission reductions are calculated as the difference between the expected removals under the Reference Level and the actual removals.

BOX 2: Example calculation of changes in above- and below ground biomass for land converted to forest plantations:

This simplified example shows the basis for setting reference levels and estimating actual removals from conversion to forest land. This simplified example based on the conversion of non-forest to forest with no different forest type.

The example is using the following assumptions:

- The average carbon stocks (aboveground and belowground) of forestland is 44 tonnes C/ha and average carbon stocks in non-forest land is 4 tonnes C/ha.
- The annual increase in carbon stocks in total biomass (aboveground and belowground) due to net growth is (44 – 4) / 20 = 2 tonnes C ha^{-1} yr^{-1}
- This means that for one ha, the total carbon stocks in biomass over time look like this based on the Removal Factor used:



- Applying this Removal Factor, it is estimated that for example in year 5 after conversion the biomass is 10 tonnes C ha^{-1}.
- There is a 10-year Reference Period (2006-2015). During the Reference Period it is known that a total of 2,250 ha was planted, average rate of planting in the reference period was therefore 225 ha / year.
- The first monitoring period is 2019-2020. In 2019, 500 ha were restored, in 2020 600 ha were restored.

- The second monitoring period is 2021-2022. The monitoring system shows that the areas restored in 2019 and 2020 have not changed. Again, in 2021, 500 ha were restored, in 2022 600 ha were restored.

The table below shows the estimation of the total carbon stocks in the land units under the Reference Level for the two monitoring periods. Following the guidance, land units have been created to track the area converted to forest land in a certain year during the crediting period. In accordance with the general guidance, for determining the Reference Level it is assumed that the average annual rate during the Reference Period (225 ha / year) would have applied during the Crediting Period. The Reference Level removals are calculated by multiplying the area of land planted with the tonnes of C/ha in the curve above leading to a value of carbon stocks in biomass in a particular year. These are then added up across all land units.

		Ha/year	Total carbon stocks in biomass in:				
			2018	2019	2020	2021	2022
Land unit 1	**Reference level projected reforestation in 2019**	225	0	450	900	1,350	1,800
Land unit 2	**Reference level projected reforestation in 2020**	225	0	0	450	900	1,350
Land unit 3	**Reference level projected reforestation in 2021**	225	0	0	0	450	900
Land unit 4	**Reference level projected reforestation in 2022**	225	0	0	0	0	450
Total carbon stocks			**0**	**450**	**1,350**	**2,700**	**4,500**

The removals are estimated as the 'total carbon stocks in biomass at the end of the monitoring period' - 'total carbon stocks in biomass at the beginning of the monitoring period. This means that the removals under the Reference Level for the first monitoring period (2019-2020) is the 'total carbon stocks for 2020' – 'total carbon stocks for 2018' = 1,350 t C. The removals under the Reference Level for the second monitoring period (2021-2022) is the 'total carbon stocks for 2022' – 'total carbon stocks for 2020' = 3,150 t C.

The actual regeneration was 500 ha (2019), 600 ha (2020), 500 ha (2021) and 600 ha (2022). Using the same calculations, this leads to the following table:

		Ha/year	Total carbon stocks in biomass in:				
			2018	2019	2020	2021	2022
Land unit 1	**Actual reforestation during 2019**	500	0	1,000	2,000	3,000	4,000
Land unit 2	**Actual reforestation during 2020**	600	0	0	1,200	2,400	3,600
Land unit 3	**Actual reforestation in 2021**	500	0	0	0	1,000	2,000
Land unit 4	**Actual reforestation in 2022**	600	0	0	0	0	1,200
Total carbon stocks			**0**	**1,000**	**3,200**	**6,400**	**10,800**

Therefore, the actual removals for the first monitoring period is 'is the total carbon stocks for 2020' – 'total carbon stocks for 2018' = 3,200 t C. The actual removals for the second monitoring period (2021-2022) is the 'total carbon stocks for 2022' – 'total carbon stocks for 2020' = 7,600 t C.

The emission reductions from Land converted to forest land is estimated as the difference between the Reference Level removals and the actual removals. For the first monitoring period (2018-2019) the difference between Reference Level and the actual removals is 3,200 – 1,350 = 1,850 t C (or 6,783 t CO_2). For the second monitoring period (2021-2022), this is 7,600 – 3,150 = 4,450 t C (or 16,317 t CO_2). The difference between the two periods is the result of the legacy removals from regeneration occurring in the first monitoring period and affecting the second monitoring period.

4.3 Emissions from organic soils associated to drainage of degraded forestland and deforested land:

13. This note is restricted to inland soils only and the assumption is that under the reference level, the forest land would be deforested or degraded, and the organic soils would be drained. This section and the example provided in box 3 does not address rewetting of soils drained before the start of the Reference Period during either the Reference Period or the monitoring period. If ER Programs would like to propose this as one of their activities, the principles of this guidance would still apply but the exact application would need to be considered on a case-by-case basis and would have to be subject to the provisions of FCPF Guideline number 2.

14. This guidance addresses the on-site CO_2-C emissions/removals from drained organic soils. Off-site CO_2 emissions and non-CO_2 emissions may be estimated provided the provisions in Chapter 2 from the Wetlands Supplement are followed or may be conservatively neglected.

15. ER Programs shall follow the approach provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (including the 2019 Refinement) and Chapter 2 and Chapter 3 of the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands ("Wetlands Supplement") considering the general guidance provided below (including guidance provided in box 3 in the form of an example).

    a) For the reference level, ER Programs shall follow the approach provided in Chapter 2 of the 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands ("Wetlands Supplement"). The annual on-site CO_2-C emissions/removals from drained organic soils in the Reference Level be calculated using equation 2.3 from the Wetland Supplement and the general guidance provided in this note (including guidance provided in box 3 in the form of an example).
    b) The actual emissions shall be determined using the approach provided in Chapter 3 of the Wetlands Supplement. The annual on-site CO_2-C emissions/removals from drained organic soils in the Reference Level be calculated using equation 3.4 and the general guidance provided in this note (see box 3 for an example). Off-site CO2 emissions and non-CO2 emissions may be estimated provided the provisions in Chapter 3 from the Wetlands Supplement are followed or may be conservatively neglected.
    c) ER Programs shall develop relevant EFs for the use in these equations following Indicator 14.3 of the FCPF Methodological Framework.
    d) Rewetting is the deliberate action of raising the water table on drained soils to re-establish water saturated conditions, e.g. by blocking drainage ditches or disabling pumping facilities. If the ER Program claims Emission Reductions from rewetting it shall have in place an IPCC Approach 3 for deforestation and forest degradation to enable full tracking of lands since the start of the reference period to the end of the applicable monitoring/reporting period.
    e) Similar to the guidance on the other topics above, land units will be created to represent the different inventory periods used in setting the reference level and for monitoring.

f) Emission reductions may be generated by a lowering of the rates of deforestation and forest degradation, or the lowering of legacy emissions from forest land previously drained.

BOX 3: Example calculation of emission reductions from rewetting of organic soils on land that was previously deforested (only on-site CO2 emissions)

This simplified example shows the basis for setting reference levels and estimating actual emissions from organic soils on forest land resulting from drainage of forestland and deforested land and estimate Emission Reductions. This simplified example is using the following assumptions:

- At the start of the Reference Period the total forest area is 100,000 ha which is all peatland. There is a 10-year Reference Period (2006-2015). The average deforestation in the reference period is 1,000 ha / year for a total of 10,000 ha.
- After deforestation, the peat is drained and the land is converted to oil palm plantations. The emission factor for the annual on-site CO_2-C emissions/removals is 10 tonnes CO_2-C ha^{-1} yr^{-1}.
- In the period 2016-2018, an additional 2,400 ha were deforested according to the monitoring system.
- The projected deforestation is in accordance with the average rate during the reference period for the monitoring period is 1,000 ha/year.
- The first monitoring period is 2019-2020 during which 600 ha were deforested in 2019 and 800 ha were deforested in 2020. During the monitoring period, 25% of the area deforested during 2006-2015 is rewetted.
- The second monitoring period 2021-2022. The same happens as the first monitoring so 600 ha is deforested in 2021 and 800 ha is deforested in 2022. During the monitoring period, another 25% of the area deforested during 2006-2015 is rewetted.
- For this example, it is assumed that the emission factor for rewetted soils is 0 (ER Programs shall apply Tier 2 EFs s in line with Indicator 14.3 of the Methodological Framework).

In accordance with the approach provided in the IPCC 2006 guidelines and following the guidance above, the example above leads to the following projected emissions under the Reference Level:

		Ha	EF ($t\ CO_2$-C ha^{-1} yr^{-1})	Emissions			
				2019	2020	2021	2022
Land unit 1	**Deforestation during 2006-2015**	10,000	10	100,000	100,000	100,000	100,000
Land unit 2	**Deforestation during 2016-2018**	2,400	10	24,000	24,000	24,000	24,000
Land unit 3	**Reference level projected deforestation during 2019**	1,000	10	10,000	10,000	10,000	10,000
Land unit 4	**Reference level projected deforestation during 2020**	1,000	10	-	10,000	10,000	10,000
Land unit 5	**Reference level projected deforestation during 2021**	1,000	10	-	-	10,000	10,000
Land unit 6	**Reference level projected deforestation during 2022**	1,000	10	-	-	-	10,000
Total projected emissions				**134,000**	**144,00**	**154,000**	**164,000**

The total Reference Level emissions for the first monitoring period (2019-2020) is the sum of the total emissions over the two years, so 134,000 + 144,000 = 278,000 t C. For the second monitoring period (2021-2022), the sum of the emissions over the two years is 318,000 t C.

Similar to the example in the other sections, the actual measured deforestation is used to determine the emission during the monitoring periods for land units 3-6. In addition, part of the area deforested during 2006-2015 is rewetted (25% in 2019 and 25% in 2021). Combining this with the emission factors leads to the following table where land unit 1 is divided in subunits to reflect the rewetting.

		Ha	EF (t C ha^{-1} yr^{-1})	Emissions			
				2019	2020	2021	2022
Land unit 1A	**Deforestation during 2006-2015 – not rewetted**	5,000	10	50,000	50,000	50,000	50,000
Land unit 1B	**Deforestation during 2006-2015 – rewetted in 2019**	2,500	0	0	0	0	0
Land unit 1C	**Deforestation during 2006-2015 – rewetted in 2021**	2,500	0 or 10	25,000	25,000	0	0
Land unit 2	**Deforestation during 2016-2018**	2,400	10	24,000	24,000	24,000	24,000
Land unit 3	**Actual deforestation during 2019**	600	10	6,000	6,000	6,000	6,000
Land unit 4	**Actual deforestation during 2020**	800	10		8,000	8,000	8,000
Land unit 5	**Actual deforestation during 2021**	600	10			6,000	6,000
Land unit 6	**Actual deforestation during 2022**	800	10				8,000
Actual emissions				**105,000**	**113,000**	**94,000**	**102,000**

The actual emissions for the first monitoring period (2019-2020) is the sum of the total emissions over the two years, so 105,000 + 113,000 = 218,000 t C. For the second monitoring period (2021-2022), the sum of the emissions over the two years is 196,000 t C.

The emission reductions from the program are therefore the difference between the expected Reference Level emissions for the monitoring period– actual emission from the monitoring period. For the first monitoring period (2019-2020) this is 278,000 – 218,000 = 60,000 t C (or 220,000 t CO_2). For the second monitoring period (2021-2022), the emission reductions are 318,000 – 196,00 = 122,000 t C (or 447,333 t CO_2).

Document History

Version	Date	Notes
Version 1	March 2021	Initial version approved by CFPs.