GLOBAL CARBON COUNCIL

Driving Climate Actions

# GCC NBS Tool for estimation of GHG emissions from oxidation and burning of peat

GCCTA004

V1.0 - 2024

www.globalcarboncouncil.com

# CONTENTS

# 1. GCC NBS Methodologies and Tools

1. Global Carbon Council (GCC) is MENA region's first and only voluntary carbon offsetting and sustainable development program that contributes to a vision of sustainable and low carbon economy of the region and catalyzes climate actions on the ground. Refer to www.globalcarboncouncil.com for details.

2. GCC Nature-based Solutions (NBS) methodologies and tools allow for conservative estimation of GHG emission reductions and changes in carbon stocks resulting from the project activity.

# 2. Scope, Applicability, and Entry into force

## 2.1. Scope

3. This tool can be used for estimation of greenhouse gases emissions (expressed in carbon dioxide equivalents) from oxidation and burning of peat in a GCC NBS project activities. The tool is applicable for estimation of carbon dioxide ($CO_2$), carbon monoxide (CO) and methane ($CH_4$) emissions from peat oxidation and peat fires occurring in the field conditions.

4. This tool can be used for estimating changes in greenhouse gases emissions in NBS projects that implement rewetting of drained peatlands or a permanent change in the water table level resulting from different land management practices.

5. This tool does not provide an approach for the estimation of direct or indirect nitrous oxide ($N_2O$) emissions from urine or dung nitrogen deposited by animals grazing on peatlands.

## 2.2. Applicability Conditions

6. The peatlands in the project area were dried and used for peat in the past but athropogenic exploitation of the drained peatland shall be discontinued at least 5 years before the project activity start date.

7. Drained peatland shall not receive any synthetic or organic fertilizers from at least 5 years before the project start date.

8. Stratification must include the peat depth and water table depth (if above the mineral soil depth).

9. Ditches shall be considered as a separate stratum.

10. Baseline scenario shall be continuation of pre-project activities (if any) in the planned project area.

## 2.3. Entry into force

11. The date of entry into force of this version of the tool is DD MM 2024.

# 3. Definitions

12. The definitions contained in the following documents shall apply:[1]

    (a) GCC definitions;

    (b) IPCC (2003). Good Practice Guidance for Land Use, Land-Use Change and Forestry;

    (c) IPCC (2006). Guidelines for National Greenhouse Gas Inventories.

    (d) IPCC (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

13. For the purpose of this tool, the following definitions shall apply:

    (a) **Peat** – refers to the surface organic layer of a soil that consists of partially decomposed organic matter, derived mostly from plant material, which has accumulated under conditions of waterlogging, oxygen deficiency, high acidity and nutrient deficiency.

    (b) **Peat oxidation** – refers to process that occurs when dried peat comes into contact with atmospheric oxygen, causing the decomposition of organic matter in peat and emission of $CO_2$ (and other greenhouse gases) to the atmosphere. To counter peat oxidation, water levels are raised to retain water in the peatlands.

    (c) **Peat fire** – refers to natural or anthropogenic fire occurring at the drained peatland in the field.

    (d) **Peat bulk density** - Bulk density is equal to the mass of dry peat per unit bulk volume. When peat materials are dried, their volume is reduced considerably. Therefore, bulk density must be calculated on the basis of the wet bulk volume to represent field conditions.

# 4. Parameters determined by the tool

14. This tool provides procedures to determine the parameters listed in Table 1.

**Table 1. Parameters determined by the tool**

| Parameter | Unit | Description |
|---|---|---|
| $GHG_{Peat\ t}$ | t $CO_2e$ | GHG emissions from burning and oxidation of peat in drained peatland, in year *t* |

# 5. Stratification

15. If the peat depth or water table level is not homogeneous within the project, stratification shall be carried out to improve the precision of estimating the change in GHG emissions. Different stratifications may be used for the baseline and project scenarios to achieve enhanced precision in the estimation of net GHG emission reductions/removals. In particular:

[1] These documents are available online at the following URLs:
(a) <http://www.globalcarboncouncil.com/resource-centre/>;
(b) <http://www.ipcc nggip.iges.or.jp/public/gpglulucf/gpglulucf.html>;
(c) <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>;
(d) <https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol4.html>.

(a) For baseline GHG emissions and removals, it is usually sufficient to stratify the area according to major factors impacting peat oxidation and fires before the project start date (e.g., peat depth, annual average water table level, presence of tree vegetation and land use types);

(b) For net GHG emission reductions/removals the stratification for ex-ante estimations may be based on the project planting/management/watering plan. The stratification for ex-post estimates should be based on the actual implementation of the project planting/management/watering plan. If natural or anthropogenic impacts (e.g., local fires, changes in water table level) or other factors (e.g., changes in management types) significantly alter the pattern of peat oxidation or peat fires in the project area, then the ex-post stratification shall be revised accordingly and may differ among monitoring periods.

# 6. Calculation of baseline GHG emissions from peat oxidation and peat fires

16. Carbon contained in dry peat is exposed to oxidation and fires. Oxidation of carbon occurs on the surface of peat that has direct contact with atmosphere and results in emission of $CO_2$ to the atmosphere. At peat fire, burning usually occurs throughout the entire volume of peat down to the water table level or mineral soil and carbon is emitted to the atmosphere in the form carbon dioxide ($CO_2$), carbon monoxide (CO) and methane ($CH_4$). Consequently, GHG emissions from peat oxidation and peat fires are calculated using stepwise approach presented in sections 6.1 to 6.5 below.

Note: To simplify notation, summation over all strata within the project boundary is omitted in the formulae applied in this tool however, if stratification is applied, Project Owners shall use data that are summed up over all strata identified within the project boundary.

## 6.1. Calculation of the average fractions of a stratum area exposed to peat oxidation and peat fires

17. It is assumed that the entire area of a stratum contains peat that is exposed to oxidation and fires. It is further assumed that peat fires occur at random in each stratum and each fire consumes the entire peat layer available for burning located within the fire area hence, the area that was burned is no longer subject to oxidation (from the year of the fire). Average fraction of a stratum area that is burned each year shall be calculated using data covering the period of at least 20 years before project start year. The following equation shall be used:

$$A_{FIRE\_AV} = \frac{\sum_{20\ years} A_{FIRE\_BSL\ t}}{20} \qquad \textit{Equation (1)}$$

$$F_{FIRE} = \frac{A_{FIRE\_AV}}{A_{BSL}}$$

Where:

| | | |
|---|---|---|
| $A_{FIRE\_AV}$ | = | Average annual area of peat fires (per stratum); ha |
| $\sum_{20\ years} A_{FIRE\_BSL\ t}$ | = | Sum of area of peat fires that occurred in the stratum in the 20 years before the project start year; ha |
| $F_{FIRE}$ | = | Average fraction of a stratum area that burns annually; dimensionless |
| $A_{BSL}$ | = | Area of the baseline stratum containing peat exposed to oxidation and fires (i.e., the stratum used for estimation of the total area of fires in the 20 years before the project start year); ha |

18. Fraction of the stratum area that burns in the year *t* shall be calculated as follows:

$$F_{BURN\,t} = F_{FIRE} * (1 - F_{FIRE})^{t-1} \quad \textit{Equation (2)}$$

Where:

| | | |
|---|---|---|
| $F_{BURN\,t}$ | = | Fraction of the stratum area that burns, in year *t* ; dimensionless |
| $F_{FIRE}$ | = | Average fraction of the stratum area that burns annually; dimensionless |
| $t$ | = | Number of years counted from the year of project start; dimensionless |

It should be noted that in all baseline calculations in this tool, *t* changes from *1* (the first year of the project) to *n* (the last year of the project).

19. Fraction of the stratum area that contains peat exposed to oxidation (i.e., peat that remains unaffected by fire (unburned) from the year of project start to the year *t*) shall be calculated as follows:

$$F_{OX\,t} = (1 - F_{FIRE})^{t} \quad \textit{Equation (3)}$$

Where:

| | | |
|---|---|---|
| $F_{OX\,t}$ | = | Fraction of the stratum area that contains peat exposed to oxidation (i.e., peat that remains unaffected by fire (unburned) from the year of project start to the year *t*); dimensionless |
| $F_{FIRE}$ | = | Average fraction of the stratum area that burns annually; dimensionless |
| $t$ | = | Number of years counted from the year of project start; dimensionless |

## 6.2. Calculation of the carbon density (per unit of area) in a stratum

20. Carbon mass per hectare, contained in peat, shall be calculated using the following equation:

$$CD_{PEAT} = BD * MIN(D_{PEAT}, |D_{WT}|) * (100\% - Hum) * (100\% - Ash) * CF * 0.001 \quad \textit{Equation (4)}$$

Where:

| | | |
|---|---|---|
| $CD_{PEAT}$ | = | Mass of carbon in dry organic matter of peat (carbon density) over 1 ha of the stratum; t C $ha^{-1}$ |
| $BD$ | = | Bulk density of peat; kg $m^{-3}$ |
| $D_{PEAT}$ | = | Average peat depth; cm |
| $\|D_{WT}\|$ | = | Average water table depth (modulus); cm |
| $MIN(D_{PEAT}, \|D_{WT}\|)$ | = | The smaller of $D_{PEAT}, \|D_{WT}\|$; cm |
| $Hum$ | = | Peat humidity; % |
| $Ash$ | = | Ash content of dry peat; % |
| $CF$ | = | Carbon fraction of dry organic matter in peat; % |

## 6.3. Calculation of the average annual carbon emissions from peat fires

21. Peat fire occurs over the $F_{BURN\,t}$ fraction of entire stratum area. The average annual carbon emissions from burning of peat shall be calculated according to the following equation:

$$C_{FIRE\,t} = A * F_{BURN\,t} * CD_{PEAT} \qquad \textit{Equation (5)}$$

Where:

| | | |
|---|---|---|
| $C_{FIRE\,t}$ | = | Average annual carbon emissions from peat fires, in year *t* (per stratum); t C |
| $A$ | = | Area of stratum; ha |
| $F_{BURN\,t}$ | = | Fraction of the stratum area that burns, in year *t* ; dimensionless |
| $CD_{PEAT}$ | = | Mass of carbon in dry organic matter of peat (carbon density) over 1 ha of the project stratum; t C $ha^{-1}$ |

It should be noted that the area of stratum ($A$) used in equation (5) may be different from the area of the baseline stratum ($A_{BSL}$) used in equation (1) because $A_{BSL}$ results from the initial stratification with respect to peat fires, whereas $A$ results from stratification with respect to peat and water table depth (referred to in section 5 above). In particular, $A_{BSL}$ may cover the entire project area if the flammability of dried peat doesn't depend on its depth.

## 6.4. Calculation of the average annual carbon emissions from oxidation of peat

22. Oxidation of peat occurs over the entire stratum area until the entire carbon contained in the stratum is depleted by the oxidation or peat fires (burning). The average annual carbon emissions from oxidation of peat shall be calculated according to the following equation:

$$C_{OX\,t} = A * F_{OX\,t} * R_{OX} * 1\ year \qquad \textit{Equation (6)}$$

Where:

| | | |
|---|---|---|
| $C_{OX\,t}$ | = | Average annual carbon emissions from oxidation of peat, in year *t* (per stratum); t C |
| $A$ | = | Area of stratum; ha |
| $F_{OX\,t}$ | = | Fraction of the stratum area that contains peat exposed to oxidation (i.e., peat that remains unaffected by fire (unburned) from the year of project start to the year *t* ); dimensionless |
| $R_{OX}$ | = | Average annual peat oxidation rate; t C $ha^{-1}$ $yr^{-1}$ |

## 6.5. Calculation of total GHG emissions from peat oxidation and peat fires

23. It is conservatively assumed that all carbon emissions resulting from oxidation of dry peat occur only in the form of $CO_2$. At peat fire, carbon is emitted to the atmosphere in the form carbon dioxide ($CO_2$), carbon monoxide (CO) and methane ($CH_4$) in proportion 79.1%, 19.4% and 1.5%, respectively[2]. Therefore, annual emission of $CO_2$ from peat oxidation and peat fires shall be calculated using the following equation:

[2] 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands; Table 2.7; page 2.41

$$GHG_{CO2\,t} = \frac{44}{12}(C_{OX\,t} + 0.791 * C_{FIRE\,t}) \quad \textit{Equation (7)}$$

Where:

| | | |
|---|---|---|
| $GHG_{CO2\,t}$ | = | Average annual emission of $CO_2$ from oxidation and burning of peat, in year $t$ (per stratum); t $CO_2$ |
| $C_{OX\,t}$ | = | Average annual carbon emissions from oxidation of peat, in year t (per stratum); t C |
| $C_{FIRE\,t}$ | = | Average annual carbon emissions from burning of peat, in year *t* (per stratum); t C |

24. Annual emission of CO from peat fires shall be calculated using the following equation:

$$GHG_{CO\,t} = \frac{28}{12} * 0.194 * C_{FIRE\,t} \quad \textit{Equation (8)}$$

Where:

| | | |
|---|---|---|
| $GHG_{CO\,t}$ | = | Average annual emission of CO from burning of peat, in year $t$ (per stratum); t CO |
| $C_{FIRE\,t}$ | = | Average annual carbon emissions from burning of peat, in year *t* (per stratum); t C |

25. Annual emission of $CH_4$ from peat fires shall be calculated using the following equation:

$$GHG_{CH4\,t} = \frac{16}{12} * 0.015 * C_{FIRE\,t} \quad \textit{Equation (9)}$$

Where:

| | | |
|---|---|---|
| $GHG_{CH4\,t}$ | = | Average annual emission of $CH_4$ from burning of peat, in year $t$ (per stratum); t $CH_4$ |
| $C_{FIRE\,t}$ | = | Average annual carbon emissions from burning of peat, in year *t* (per stratum); t C |

26. Total annual GHG emissions from oxidation and burning of peat shall be calculated using the following equation:

$$GHG_{Peat\,t} = GHG_{CO2\,t} + GHG_{CO\,t} + GHG_{CH4\,t} * GWP_{CH4} \quad \textit{Equation (10)}$$

Where:

| | | |
|---|---|---|
| $GHG_{Peat\,t}$ | = | Total GHG emissions from oxidation and burning of peat, in each year $t \leq n$; t $CO_2e$ |
| $GHG_{CO2\,t}$ | = | Average annual emission of $CO_2$ from oxidation and burning of peat, in year $t \leq n$ |
| $GHG_{CO\,t}$ | = | Average annual emission of CO from oxidation and burning of peat, in year $t \leq n$ (per stratum); t CO |
| $GHG_{CH4\,t}$ | = | Average annual emission of $CH_4$ from burning of peat, in year $t \leq n$ (per stratum); t $CH_4$ |

$GWP_{CH4}$ = Global warming potential for methane; t $CO_2$e t $CH_4^{-1}$

Note: it is conservatively assumed that $GWP_{CO} = 1$.

27. The oxidation and burning of peat will occur until the peat is completely depleted what will happen in year $t_{FIN} = CD_{PEAT} / R_{OX}$. Consequently, time *t* used in all equations of this tool shall not exceed $t_{FIN}$.

28. To simplify notation, summation over all strata within the project boundary is omitted in the formulae applied in this tool. However, if stratification is applied, Project Owners shall use data that are summed up over all strata identified within the project boundary.

# 7. Calculation of GHG emissions from peat oxidation and peat fires using ex-post monitored data

29. Carbon mass per hectare contained in peat shall be calculated using equation 4 with the following entries obtained from monitoring (or default, as appropriate):

$BD$ = Bulk density of peat; kg $m^{-3}$

$D_{PEAT}$ = Average peat depth; cm

$|D_{WT}|$ = Average water table depth (modulus); cm

$Hum$ = Peat humidity; %

$Ash$ = Ash content of dry peat; %

$CF$ = Carbon fraction of dry organic matter in peat; %

30. Equations 5 and 6 shall be used to calculate carbon emissions from peat fires and oxidation of peat, however, $A * F_{BURN\,t}$ shall be replaced with monitored data on the area of peat fires (if any); and $A * F_{OX\,t}$ shall be replaced with monitored data on area of peat exposed to oxidation (areas that are not rewetted).

# 8. Data and parameters used in the tool

31. The following tables describe the data and parameters used in this tool. The guidelines contained in these tables regarding the selection of data sources, and the measurement procedures to be followed, should be treated as an integral part of this tool.

## 8.1. Data and parameters not measured

*Data/Parameter Table 1.1.*

| **Data / Parameter:** | $GWP_{CH4}$ |
|---|---|
| Data unit: | t $CO_2$e (t $CH_4$)$^{-1}$ |
| Used in equations: | 12, 13 |
| Description: | Global warming potential for methane |
| Measurement procedures: | NA |
| Monitoring frequency: | NA |
| QA/QC procedures: | NA |

*Data/Parameter Table 1.2.*

| **Data / Parameter:** | $CF$ |
|---|---|
| Data unit: | % |
| Used in equations: | 4 |
| Description: | Carbon fraction of dry organic matter in peat |
| Measurement procedures: | Conservative default value =53%<br>Calculated using data provided by:<br>Perie, Catherine & Ouimet, Rock. (2008). Organic carbon, organic matter and bulk density relationships in boreal forest soils. Canadian Journal of Soil Science. 88. 315-325. 10.4141/CJSS06008. |
| Monitoring frequency: | NA |
| QA/QC procedures: | NA |

## 8.2. Data and parameters measured

*Data/Parameter Table 2.1.*

| **Data / Parameter:** | $\sum_{20\ years} A_{FIRE\_BSL\ t}$ |
|---|---|
| Data unit: | ha |
| Used in equations: | 1 |
| Description: | Sum of area of peat fires that occurred in the stratum during 20 years before the project start year |
| Measurement procedures: | Data collected from historical records. Actual data on historical fire areas and historical satellite imageries shall be used. |
| Monitoring frequency: | One time |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.2.*

| **Data / Parameter:** | $A_{BSL}$ |
|---|---|
| Data unit: | ha |
| Used in equations: | 1 |
| Description: | Area of baseline stratum containing peat exposed to oxidation and fires |
| Measurement procedures: | GIS-system tools and/or ground-based measurements. Standard operating procedures (SOPs) prescribed under national forest or land inventory are applied. In the absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied |
| Monitoring frequency: | One time |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.3.*

| **Data / Parameter:** | $A$ |
|---|---|
| Data unit: | ha |
| Used in equations: | 5 |
| Description: | Area of peat exposed to oxidation or burning (per stratum); |
| Measurement procedures: | GIS-system tools and/or ground-based measurements. Standard operating procedures (SOPs) prescribed under national forest or land inventory are applied. In the absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied |
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.4.*

| **Data / Parameter:** | $D_{PEAT}$ |
|---|---|
| Data unit: | cm |
| Used in equations: | 4 |
| Description: | Average peat depth in stratum |
| Measurement procedures: | A peat corer shall be used to measure the entire thickness of peat down to the soil mineral layer. The measurements shall be repeated in a number of points randomly located throughout the stratum (or systematic sampling points location with random start) in order to achieve precision level set by the methodology. |
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.5.*

| **Data / Parameter:** | $D_{WT}$ |
|---|---|
| Data unit: | cm |
| Used in equations: | 4 |
| Description: | Average water table depth in stratum |
| Measurement procedures: | Perforated PVC tube shall be immersed through the entire thickness of peat down to mineral layer. The measurement shall be done after stable water table level is reached inside the tube (usually after at least 3 hours). The water level is measured from peat surface to the water table. The measurements shall be repeated in a number of points randomly located throughout the stratum (or systematic sampling points location with random start) in order to achieve precision level set by the methodology. |
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC |

| | |
|---|---|
| | procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.6.*

| | |
|---|---|
| **Data / Parameter:** | $BD$ |
| Data unit: | kg $m^{-3}$ |
| Used in equations: | 4 |
| Description: | Bulk density of dry peat |
| Measurement procedures: | Procedure set by ISO 11272 shall be applied (i.e., core samples of known volume shall be taken with a metal sampling tool. The sample is dried in an oven and weighed, and the dry bulk density is calculated).<br>The measurements shall be repeated in a number of points randomly located throughout the stratum (or systematic sampling points location with random start) in order to achieve precision level set by the methodology. |
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.7.*

| | |
|---|---|
| **Data / Parameter:** | $Hum$ |
| Data unit: | % |
| Used in equations: | 4 |
| Description: | Peat humidity (Peat water content) |
| Measurement procedures: | The peat water content is calculated as follows:<br>$\frac{(\text{Wet peat weight} - \text{Dry peat weight}) * 100\%}{\text{Wet peat weight}} = \text{Peat water content}, \%$<br>Wet peat weight is obtained by weighing peat samples in their original state. To obtain wet peat weight, the samples shall be weighed as soon as possible after their collection. To obtain dry peat weight, peat samples must be dried to a constant weight (at least for 24 hours at 105°C).<br>The result represents the percentage of water that was present in the peat when it was collected.<br>The measurements shall be repeated in a number of points randomly located throughout the stratum (or systematic sampling points location with random start) in order to achieve precision level set by the methodology. |
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.8.*

| | |
|---|---|
| **Data / Parameter:** | $Ash$ |
| Data unit: | % |

| | |
|---|---|
| Used in equations: | 4 |
| Description: | Ash content of dry peat |
| Measurement procedures: | The ash content is calculated as follows:<br>$\frac{\text{Ash weight} * 100\%}{\text{Dry peat weight}} = \text{Ash content}, \%$<br>The ash weight in peat is determined by burning a peat sample at a temperature of 800±25°C for at least 3 hours. Ash content is defined as the ratio of the mass of the residue after combustion to the initial mass of dry peat.<br>The measurements shall be repeated in a number of points randomly located throughout the stratum (or systematic sampling points location with random start) in order to achieve precision level set by the methodology. |
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

*Data/Parameter Table 2.9.*

| | |
|---|---|
| **Data / Parameter:** | $R_{OX}$ |
| Data unit: | t C $ha^{-1}$ $yr^{-1}$ |
| Used in equations: | 6 |
| Description: | Average annual peat oxidation rate |
| Measurement procedures: | Long-term or intermediate peat oxidation rate is preferred. It should be estimated following procedures provided by Waddington & McNeil (2002)*. If contemporary peat oxidation rate measurements are performed, they shall follow procedures described in Pavelka et all. (2018)** and approach for obtaining average annual estimates shall be provided and justified by Project Owners.<br>If none of the above options is feasible, then default data provided by IPCC (2014)*** may be used. The default values shall be checked for their applicability in the project area and adjusted if necessary to ensure a conservative approach.<br><br>* Waddington, J. M and McNeil, P. 2002. Peat oxidation in an abandoned cutover peatland. Can. J. Soil Sci. 82: 279–286<br>** Pavelka M., Acosta M., Kiese R., Altimir N., Brümmer C., Crill P., Darenova E., Fuß R., Gielen B., Graf A., Klemedtsson L., Lohila A., Longdoz B., Lindroth A., Nilsson M., Jiménez S.M., Merbold L., Montagnani L. Peichl M. Pihlatie M. Pumpanen J., Ortiz P.S., Silvennoinen H., Skiba U., Vestin P., Weslien P., Janous D., Kutsch W. Standardisation of chamber technique for CO2, N2O and CH4 fluxes measurements from terrestrial ecosystems // Int. Agrophys. 2018. V. 32. P. 569–587. doi: 10.1515/intag-2017-0045.<br>***IPCC (2014) 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. & Troxler, T.G. (eds.). IPCC, Switzerland, 354 pp. Online at: http://www.ipcc-nggip.iges.or.jp/public/wetlands/pdf/Wetlands_Supplement_Entire_Report.pdf, |

| | |
|---|---|
| Monitoring frequency: | According to requirements set by the applied methodology |
| QA/QC procedures: | Quality control/quality assurance (QA/QC) procedures prescribed under National GHG Inventories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied |

## 8.3. Monitoring of Tool Implementation

32. Information shall be provided in the project submission form (PSF), to establish that the commonly accepted principles and practices of the fertilizer inventory in the host country are implemented. If such principles and practices are not known or available, standard operating procedures (SOPs) and quality control/quality assurance (QA/QC) procedures for inventory operations, including field data collection and data management, shall be identified, recorded, and applied. Use or adaptation of SOPs available from published relevant handbooks, or from the IPCC (2003) “Good Practice Guidance for Land Use, Land-Use Change and Forestry”, is recommended.

| DOCUMENT HISTORY | | |
|---|---|---|
| **Version** | **Date** | **Comment** |
| V 1.0 | 06/11/2024 | Initial adoption by GCC Regulatory Committee based on following:<br>i. Consideration by individual Regulatory Committee members, followed by evaluation of entire Regulatory Committee.<br>ii. 30 days global stakeholder consultation taken place from 06/11/2024 to 05/12/2024. |