



**GLOBAL
CARBON
COUNCIL**

Driving Climate Actions

**GCC AFOLU Tool for
estimation of change in soil
organic carbon content in
mineral soils**

**GCC TA002
V1.0 - 2024**

CONTENTS

1. GCC AFOLU METHODOLOGIES AND TOOLS.....	3
2. SCOPE, APPLICABILITY, AND ENTRY INTO FORCE	3
2.1. SCOPE	3
2.2. APPLICABILITY CONDITIONS	3
2.3. ENTRY INTO FORCE.....	3
3. DEFINITIONS.....	4
3.1. PARAMETERS DETERMINED BY THE TOOL.....	4
3.2. STRATIFICATION.....	5
3.3. NUMBER OF SAMPLING PLOTS	6
3.4. SAMPLING PLOT LOCATIONS	6
3.5. EXTRACTING SOIL CORES	6
3.6. COMPOSITING OF SOIL CORES	7
3.7. SAMPLE STORAGE AND HANDLING	8
3.8. MEASUREMENT OF BULK DENSITY AND SOC.....	8
3.9. CALCULATION OF SOIL ORGANIC CARBON ON PER HECTARE BASIS.....	8
4. DATA AND PARAMETERS USED IN THE TOOL	12
4.1. DATA AND PARAMETERS NOT MEASURED	12
4.2. DATA AND PARAMETERS MEASURED	12
4.3. MONITORING OF TOOL IMPLEMENTATION	15

1. GCC AFOLU 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 a sustainable and low carbon economy of the region and catalyses climate actions on the ground. Refer to www.globalcarboncouncil.com for details.
2. GCC AFOLU 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 the estimation of carbon stock and change in carbon stock in soil organic carbon pool in a GCC AFOLU project activity. The tool is applicable for:
 - (a) Estimation of carbon stock and change in soil organic carbon pool in the baseline;
 - (b) Ex-post estimation of carbon stock and change in soil organic carbon pool for monitoring of project activities.
4. In particular, this tool can be used for estimation of carbon stocks and changes in the soil organic carbon pool in AFOLU projects implementing a change from conventional agricultural practices (e.g., full tillage) to regenerative agriculture, natural and organic farming, agroforestry and other land management practices that lead to increased carbon accumulation in soil.

2.2. Applicability Conditions

5. This tool is applicable under the following conditions:
 - (a) The land subject to the project activity does not fall under the wetland category¹;
 - (b) The land subject to the project activity does not contain organic soils²; however, mineral soils covered by a shallow peat layer of depth less than 5 cm are allowed;
 - (c) Project activities do not alter the groundwater table if located at less than 1 m depth.

2.3. Entry into force

6. The date of entry into force of this version of the methodology is **DD MM 2024**.

¹ Wetland as a land category is defined in Annex A: Glossary of IPCC, Good Practice Guidance for Land Use, Land-use Change and Forestry (IPCC, GPG-LULUCF).

² Organic soil is defined in 2006 IPCC Guidelines (Annex 3A.5, Chapter 3 in Volume 4) . The definition is followed in Chapter 1, Note 3 of 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands.

3. Definitions

7. The definitions contained in the following documents shall apply:³
 - (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) 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands
 - (e) IPCC (2019). 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
8. For the purpose of this tool, the following definitions shall apply:
 - (a) **Aliquot** – an exactly defined (depth, surface area, etc.) soil is associated with an exactly defined location in a field.
 - (b) **Composite** is a sample of soil that represents soil from several samples and is typically used to provide a single representative sample from a field or area of interest.
 - (c) **Composite sampling** is the aggregation and mixing of multiple soil aliquots (samples of soil from the field) for subsequent measurement of a composite sample representative of the SOC within the area/field. Since only the composite soil samples are measured the number and hence cost of analyses is reduced.
 - (d) **Dynamic baseline scenario** is baseline scenario at which soil organic carbon stock changes in time.
 - (e) **Sample** may be:
 - i)* an individual sample taken from a particular location; or
 - ii)* a composite sample that combines samples taken from several locations into a single sample.
 - (f) **Soil disturbance** - refers to any activity that results in a decrease in soil organic carbon (SOC), for example ploughing, ripping, scarification, digging of pits and trenches, stump removal, etc.

3.1. Parameters determined by the tool

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

Table 1. Parameters determined by the tool

³ 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.ch/publication/2013-supplement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories-wetlands/>>
- (e) <<https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol4.html>>.

Parameter	Unit	Description
SOC_{sp,t_0}	t C ha ⁻¹	Carbon stock in the soil organic carbon (SOC) pool at sample plot sp , at time t_0
SOC_{sp,t_n}	t C ha ⁻¹	Carbon stock in the soil organic carbon (SOC) pool at sample plot sp , in sampling round occurring in year t_n ($n \geq 1$)
$\Delta SOC_{BSL t_n}$	t CO ₂ e	Change in carbon stock in the soil organic carbon (SOC) pool averaged over all sample plots located in a stratum, under baseline in year t_n
$\Delta SOC_{PRJ k_2}$	t CO ₂ e	Change in carbon stock in the soil organic carbon (SOC) pool averaged over all sample plots located in a stratum, under project occurring in monitoring period number k_2

3.2. Stratification

10. By default, each project implementing this tool must identify at least three strata and three sample plots per stratum.
11. If the relevant carbon pool distribution over the project area is not homogeneous, stratification is carried out to improve the precision of estimation of carbon stocks and/or the changes in carbon stocks. Different stratifications may be appropriate for the baseline and project scenarios to achieve optimal precision of estimation of net GHG emission reductions/removals. In particular:
 - (a) For baseline GHG emissions and removals, it is usually sufficient to stratify the area according to major factors impacting soil organic carbon pool and its changes before the project start date (e.g., soil type, management, 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 plan. The stratification for ex-post estimations should be based on the actual implementation of the project planting/management plan. If natural or anthropogenic impacts (e.g., local fires) or other factors (e.g., changes in management types) significantly alter the pattern of carbon distribution in the project area, then the ex-post stratification shall be revised accordingly and may differ among monitoring periods.
12. It is recommended that:
 - (a) Stratification is undertaken to minimize the variation in soil carbon stock within each stratum.
 - (b) Soil within strata is homogenous with respect to land management, soil type, landform, and/or other variables.
 - (c) Variables highly correlated to carbon content or stock are used to inform the stratification of project area into individual strata.
 - (d) Project area is re-stratified for each sampling round as more information becomes available.
13. Stratification of the project area shall be performed in such a way that the use of paired sampling locations over time is possible.

3.3. Number of Sampling Plots

14. The number of sampling plots shall be calculated using “GCC Tool for calculation of a number of sampling plots” using data on the number of planned strata, their area, expected means, standard deviations, and known area of each sample.

3.4. Sampling Plot Locations

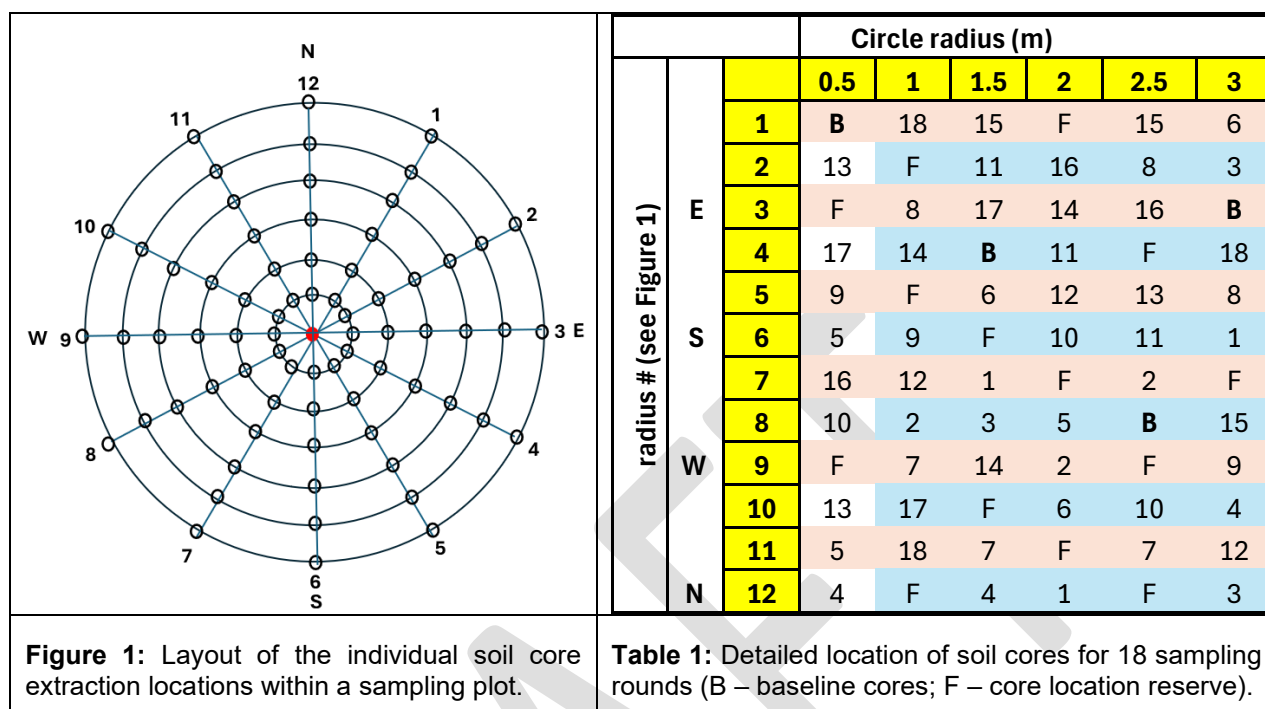
15. It is required that:
 - (a) Sampling plot locations must be determined prior to any core extraction in each stratum for a given sampling round or estimation event.
 - (b) Each geographic location of a centre point (red dot in Figure 1) of an assigned sampling plot is recorded and marked on the ground in a manner not visible to the public.
 - (c) Within each stratum, sampling plot locations are assigned following a systematic sampling grid with a random start, or using a pseudo-random number generator with a defined seed number in a way that is transparent, reproducible, and verifiable while ensuring that a genuinely random allocation of sampling plot locations is achieved.
16. If a large immovable obstruction prevents sampling at an assigned sampling plot location, the actual sampling plot location is to be determined by one of the following processes:
 - (a) Using one of the alternative sampling plot locations defined in the reserve list of sampling point locations for the current sampling round (preferred).
 - (b) Offsetting towards other locations within the project boundary that is the closest one to the affected sampling plot location and free from the obstruction.

3.5. Extracting Soil Cores

17. If the field implemented technology used to measure SOC does not require extracting soil cores (e.g., in the case of non-destructive methods), references to cores shall be replaced *mutatis mutandis* with references to measurements using the above-mentioned technology.
18. Each soil core⁴ location shall be cleared of living plants, plant litter, and surface rocks, prior to core extraction using a consistent protocol between sampling rounds. It is important that clearing is limited to the closest neighborhood of the core to be collected so locations of other cores (to be collected in the future) remain unaffected. Walking within the sampling plot shall be limited as much as possible.
19. At each sampling plot, for the baseline determination one undisturbed soil core shall be collected for the soil bulk density measurement while three remaining cores may be composited for the soil organic carbon measurement. All baseline soil cores shall be of the same volume (i.e., the coring device size shall be the same for collection of all baseline soil cores).
20. In the project case, at each sampling plot, three soil cores shall be collected in each sampling round. These cores shall be used for soil carbon measurement. They may be

⁴ A soil core is a continuous length of soil taken with a soil probe to a specific depth.

composited (explained in para 27) to account for possible microvariability within the sampling plot. The layout of the individual soil core extraction locations presented in Figure 1 and detailed in Table 1.



21. If the field implemented technology to measure SOC does not require extracting soil cores (i.e., samples) then the measuring unit shall be calibrated to collect data from a depth of 0 to 30 cm (or more than 30 cm if selected; note that para 23 below applies) and relevant paras referring to soil cores/samples below may be skipped.
22. Soil cores are collected to a depth of at least 30 cm - however, the actual sampling depth may be less than 30 cm for a core where the nominated soil depth cannot be reached due to bedrock or impenetrable layers. The actual sampling depth must be recorded.
23. The same sampling depth shall be maintained for all sampling rounds at each sampling plot during the entire crediting period.
24. Extracted soil may be analyzed for all soil properties separately for the different layers however, the final data shall be expressed for the 0-30 cm layer, or the relevant layer if cores are collected to a depth exceeding 30 cm.
25. If more than one auger is used to collect soil cores, then all augers shall be of the same diameter.
26. All sampling rounds shall be performed in the same season of the year and each round shall last no more than 60 calendar days. The median day of a sampling round should be used in the calculation of GHG emissions and removals using data collected during that round.

3.6. Compositing of Soil Cores

27. Compositing is the practice of combining cores together to capture variability while

reducing assay costs. Compositing samples should be perfectly homogenized after collection so that equal parts of constituent samples are present in any given aliquot of the compositing sample.

28. Three cores extracted at each sampling plot during the same sampling round may be compositing to reduce assay costs and to account for possible microvariability within the sampling plot.
29. Samples collected within the same stratum may be further compositing following good practice rules for compositing soil samples (available from manuals on sampling for soil organic carbon).
30. Compositing shall not be implemented where perfect homogenization may be difficult to achieve, e.g., for soils with high clay content that tend to clod, which can compromise the validity of compositing.
31. Each soil sample shall be labelled with a unique identifier allowing for unambiguous allocation to the sampling site and sampling round (e.g., by recording the sampling date). Samples expected to be analyzed shall be packed in airtight bags or containers and cooled before delivery to the laboratory.

3.7. Sample Storage and Handling

32. Field collected soil samples shall be packed in airtight plastic bags with most of the air removed and placed in an insulated, cool/refrigerated, dark container for transport to the laboratory and storage prior to processing for soil carbon analysis. Each bag shall be unambiguously labelled to allow for numerical processing and repeated measurements if necessary.

3.8. Measurement of bulk density and SOC

33. If the field implemented technology to measure SOC does not require extracting cores (e.g., in the case of non-destructive methods) then the output shall include bulk density measurements and SOC averaged over the 0-30 cm layer as separate data (for baseline and project case). The accuracy of data collected using such technology shall meet the accuracy of data acquired using the laboratory approach referred to below.
34. Core sampling is a typical method for measuring bulk density. Collected undisturbed soil samples are returned to the laboratory, dried to a constant weight, weighed, sieved through a 2-mm sieve, and rock fragments are weighed.
35. Measurement of bulk density and SOC shall be performed at a laboratory certified by a national (or relevant international) certification body for such measurements. Measurement procedures covered by the certificate shall be used.

3.9. Calculation of Soil Organic Carbon on per Hectare Basis

36. Calculation of soil organic carbon on a per hectare basis shall be performed separately for each sampling plot or each composite sample if samples from several sampling plots are compositing for laboratory analysis. As a comparison of paired baseline and project data is preferred, the same compositing scheme shall be implemented in both cases.

37. For SOC determination at the time t_0 (i.e., at the initial point of time or for static baseline SOC determination), the SOC stock expressed on a per hectare basis shall be calculated according to the following equations:

a) Soil (fine fraction) bulk density (at sampling plot sp):

$$BD_{sp,t_0} = \frac{M_{FF}}{V_{FF}} = \frac{MT_{sp} - CF_{sp}}{VT_{sp} - \frac{CF_{sp}}{\rho_{CF}}} \quad \text{Equation (1)}$$

Where:

BD_{sp,t_0}	=	Bulk density (initial or for static baseline); $\text{g cm}^{-3} = \text{t m}^{-3}$
M_{FF}	=	Mass of the fine fraction (<2 mm); g
V_{FF}	=	Volume of the fine fraction (<2 mm); cm^3
MT_{sp}	=	Mass of total soil sample, in the initial or static baseline case; g
CF_{sp}	=	Mass of the coarse fragments (i.e., all coarse fragments >2mm) contained in total soil sample, in the initial or static baseline case; g
VT_{sp}	=	Volume of the total soil sample, in the initial or static baseline case; cm^3
ρ_{CF}	=	Density of the coarse fragments S ($\rho_{CF} = 2.65 \text{ g cm}^{-3}$); g cm^{-3}

Note that the numerical value of initial or baseline bulk density (BD_{sp}) will be used in all future calculation of SOC at the same sampling plot however, it will be adequately adjusted using factors reflecting the future SOC concentration measured at the same sampling plot.

b) Soil organic carbon (SOC) stock at time t_0 per hectare (at sampling plot sp):

$$SOC_{sp,t_0} = d * BD_{sp,t_0} * C_{sp,t_0} * \left(1 - \frac{CF_{sp}}{\rho_{CF} * VT_{sp}}\right) * 10^4 \quad \text{Equation (2)}$$

Where:

SOC_{sp,t_0}	=	Carbon stock in the soil organic carbon (SOC) pool at sampling plot sp , at time t_0 ; t C ha^{-1}
d	=	Sampling depth (0.3 m = 30 cm, wherever possible); m
C_{sp,t_0}	=	SOC concentration at sample plot sp , at time t_0 ; %
BD_{sp,t_0}	=	Bulk density at sampling plot sp (calculated according to eq. 1), at time t_0 ; $\text{g cm}^{-3} = \text{t m}^{-3}$
$\frac{CF_{sp}}{\rho_{CF} * VT_{sp}}$	=	Volumetric content of rock fragments >2 mm; dimensionless
10^4	=	Factor allowing for the output unit;

Bulk density is usually expressed in megagrams per cubic metre (Mg/m^3) but the numerically equivalent units of g/cm^3 and t/m^3 are also used ($1 \text{ Mg/m}^3 = 1 \text{ g/cm}^3 = 1 \text{ t/m}^3$)

38. For SOC determination at time t_n (i.e., at n-th monitoring event, usually occurring in year t_n), the SOC stock expressed on per hectare basis shall be calculated according to the following equations:

$$SOC_{sp,t_n} = d * BD_{sp,t_0} * C_{sp,t_n} * \frac{1-K*C_{sp,t_{n-1}}}{1-K*C_{sp,t_n}} * \left(1 - \frac{CF_{sp}}{\rho_{CF}*VT_{sp}}\right) * 10^4 \quad \text{Equation (3)}$$

Where:

SOC_{sp,t_n}	=	Carbon stock in the soil organic carbon (SOC) pool at sampling plot sp , in the sampling round occurring in year t_n ; t C ha ⁻¹
d	=	Sampling depth (0.3 m=30 cm wherever possible); m
BD_{sp,t_0}	=	Bulk density (initial or baseline at the same sampling plot); g cm ⁻³ =t m ⁻³
C_{sp,t_n}	=	Organic carbon concentration at sampling plot, measured in year t_n ; %
$C_{sp,t_{n-1}}$	=	Organic carbon concentration at sampling plot, measured in year t_{n-1} ; %
K	=	Van Bemmelen factor that relates the total mass of organic C in the soil to the soil organic matter (k = 1.9); dimensionless
$\frac{CF_{sp}}{\rho_{CF} * VT_{sp}}$	=	Volumetric content of rock fragments >2 mm; dimensionless
10^4	=	Factor allowing for the output unit;

Note that Eq. 3 implements approach proposed by Fowler, A.F, Basso. B., Millar, N. and Brinton. W. F. 2023. A simple soil mass correction for a more accurate determination of soil carbon stock changes. Nature – Scientific Reports. 13:2242.

39. Equations 2 and 3 may be combined to estimate the change in SOC at sampling plot sp between measurements occurring at t_n and t_{n-1} :

a) For baseline (i.e., baseline SOC change on per annum basis):

$$\Delta SOC_{BLSL\ sp\ t_n} = \frac{44}{12} * \frac{SOC_{BLSL\ sp,t_n} - SOC_{BLSL\ sp,t_{n-1}}}{t_n - t_{n-1}} * 1\ year \quad \text{Equation (4)}$$

Where:

$\Delta SOC_{BLSL\ sp\ t_n}$	=	Annual change in carbon stock in the soil organic carbon (SOC) pool at sampling plot sp , under a dynamic baseline scenario (note that $t_n - t_{n-1}$ shall be expressed in number of years and fraction of them, if necessary, to exactly reflect the difference between t_n and t_{n-1}); t CO ₂ e ha ⁻¹
$SOC_{BLSL\ sp,t_n}$ $SOC_{BLSL\ sp,t_{n-1}}$	=	Carbon stock in the soil organic carbon (SOC) pool at sampling plot sp , under baseline, in the sampling round occurring in year t_n or t_{n-1} ; t C ha ⁻¹ Note, Equation 2 shall be used to calculate carbon stock in the soil organic carbon (SOC) pool at time t_0 ; Equation 3 shall be used to calculate carbon stock in the soil organic carbon (SOC) pool in the sampling round occurring in year $t_n > 0$.
$t_n - t_{n-1}$	=	Period between two consecutive sampling rounds expressed in number of years and fraction of them, if necessary, to exactly reflect the difference between t_n and t_{n-1} ; yr

Note that baseline SOC change may be conservatively assumed as zero, if: (i) land subject to project activity is degraded or degrading; (ii) management or land use change implemented less than 20 years ago lead to decrease in SOC stock as estimated using A/R TOOL 16: “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities”, or (iii) management

and land use activities have not changed during at least ten years preceding start date of the project activity.

Further note that if management or land use change implemented less than 20 years ago lead to increase in SOC stock as estimated using A/R TOOL 16: "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", then the change in SOC calculated using Eq. 4 may be assumed to be constant for the period covering 20 years from the change mentioned above and assumed as zero for the remaining part of the crediting period.

b) For SOC accumulation under project case:

$$\Delta SOC_{PRJ\ sp\ k_2} = \frac{44}{12} * (SOC_{sp,k_2} - SOC_{sp,k_1}) \quad \text{Equation (5)}$$

Where:

$\Delta SOC_{PRJ\ sp\ k_2}$	=	Change in carbon stock in the soil organic carbon (SOC) pool at sampling plot sp , under project activity occurring in monitoring period number k_2 ; t CO ₂ e ha ⁻¹
k	=	Ex-post number of monitoring period; dimensionless
k_1, k_2	=	Ex-post number of two sequential (but not necessarily adjacent) monitoring periods (k_1 and k_2 , $k_2 > k_1$) at which SOC data are collected; dimensionless

Note that in contrast to ex-ante projection where annual data are available, in ex-post situation only discrete data (positioned at the date of completion of monitoring reports) are recorded and duration of each monitoring period may be different. Additionally, SOC data need not to be collected at each monitoring round when data on carbon stocks in other carbon pools (e.g., above-ground biomass) are collected.

40. Change in carbon stock in the soil organic carbon (SOC) pool shall be averaged over all sampling plots located in a stratum:

c) For baseline (annual change):

$$\Delta SOC_{BSL\ t_n} = \frac{\sum_{sp} \Delta SOC_{BSL\ sp\ t_n}}{n_{BSL\ sp}} * A_{BSL\ t_n} \quad \text{Equation (6)}$$

d) For project (change between two sequential (but not necessarily adjacent) monitoring periods):

$$\Delta SOC_{PRJ\ k_2} = \frac{\sum_{sp} \Delta SOC_{PRJ\ sp\ k_2}}{n_{PRJ\ sp}} * A_{PRJ\ k_2} \quad \text{Equation (7)}$$

Where:

$\Delta SOC_{BSL\ t_n}$	=	Change in carbon stock in the soil organic carbon (SOC) pool averaged over all sampling plots located in a stratum, under baseline in year t_n ; t CO ₂ e
$\Delta SOC_{PRJ\ k_2}$	=	Change in carbon stock in the soil organic carbon (SOC) pool averaged over all sampling plots located in a stratum, under project, occurring in monitoring period k_2 ; t CO ₂ e
$A_{BSL\ t_n}$	=	Area of a baseline stratum identified in year t_n ; ha
$A_{PRJ\ k_2}$	=	Area of a project stratum identified in monitoring period number k_2 ; ha

$n_{BSL\ sp}, n_{PRJ\ sp}$ = Number of sampling plots in a stratum under baseline and project, respectively; dimensionless

41. To simplify notation, summation over all strata within project boundary is omitted in 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.

4. Data and Parameters used in the tool

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

4.1. Data and Parameters not measured

Data/Parameter Table 1.1.

Data / Parameter:	ρ_{CF}
Data unit:	g cm ⁻³
Used in equations:	3, 4
Description:	Density of coarse fragments (=2.65 g cm ⁻³);
Measurement procedures:	Default
Monitoring frequency:	NA
QA/QC procedures:	Taken from: Federer, C.A., Turcotte, D.E., and Smith, C.T. 1993. The organic fraction - bulk density relationship and the expression of nutrient content in forest soils. Can. J. For. Res. 23: 1026-1032.

Data/Parameter Table 1.2.

Data / Parameter:	K
Data unit:	dimensionless
Used in equations:	3, 4
Description:	Van Bemmelen factor that relates the total mass of organic C in the soil to the soil organic matter (K = 1.9);
Measurement procedures:	Default
Monitoring frequency:	NA
QA/QC procedures:	Van Bemmelen factor numerical data taken from: Fowler, A.F, Basso. B., Millar, N. and Brinton. W. F. 2023. A simple soil mass correction for a more accurate determination of soil carbon stock changes. Nature – Scientific Reports. 13:2242. https://doi.org/10.1038/s41598-023-29289-2

4.2. Data and parameters measured

Data/Parameter Table 2.1.

Data / Parameter:	BD_{sp}
Data unit:	$1 \text{ Mg/m}^3 = 1 \text{ g/cm}^3 = 1 \text{ t/m}^3$
Used in equations:	1, 2, 3, 4
Description:	Bulk density (initial or for static baseline);
Measurement procedures:	FAO Standard operating procedure for soil bulk density by cylinder method https://openknowledge.fao.org/server/api/core/bitstreams/deed7688-a43e-4532-962f-d48768bd61c4/content In the case of non-destructive methods, the unit manufacturer's standard operating procedure shall be followed.
Monitoring frequency:	As required in the applicable methodology
QA/QC procedures:	Quality control/quality assurance (QA/QC) procedures prescribed under national soil organic carbon inventory 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:	MT_{sp}
Data unit:	g
Used in equations:	1
Description:	Mass of total soil sample, in the initial or static baseline case; g
Measurement procedures:	Soil samples shall be processed according to procedures implemented by accredited analytical laboratory that will perform soil analyses.
Monitoring frequency:	As required in the applicable methodology
QA/QC procedures:	Quality control/quality assurance (QA/QC) procedures prescribed for the accredited laboratories 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:	CF_{sp}
Data unit:	g
Used in equations:	1
Description:	Mass of the rock fragments (i.e., all coarse fragments >2mm) contained in total soil sample, in the initial or static baseline case
Measurement procedures:	Soil samples shall be processed according to procedures implemented by accredited analytical laboratory that will perform soil analyses.
Monitoring frequency:	As required in the applicable methodology
QA/QC procedures:	Quality control/quality assurance (QA/QC) procedures prescribed for accredited laboratories 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:	VT_{sp}
--------------------------	-----------

Data unit:	cm ³
Used in equations:	1, 2, 3
Description:	Volume of the total soil sample, in the initial or static baseline case;
Measurement procedures:	Volume of the total soil sample is defined by size of an auger used to collect soil samples. All soil samples shall be collected using augers of the same type and size.
Monitoring frequency:	As required in the applicable methodology
QA/QC procedures:	Quality control/quality assurance (QA/QC) procedures prescribed under national soil inventory 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
Data unit:	m
Used in equations:	2, 3, 4
Description:	Sampling depth (0.3 m wherever possible);
Measurement procedures:	Sampling depth should be established by using auger allowing for extraction of soil cores of 0.3 m length.
Monitoring frequency:	As required in the manufacturer's operating procedures but not less than one time per sampling round.
QA/QC procedures:	Augers should be checked daily for damage and wear as part of each monitoring campaign.

Data/Parameter Table 2.5.

Data / Parameter:	C_{sp,t_0}
Data unit:	%
Used in equations:	2
Description:	Organic carbon concentration at sampling plot, in sampling round occurring in year t_0
Measurement procedures:	All methods used by accredited analytical laboratories are allowed, but the use of dry combustion method is recommended. If the field implemented technology to measure SOC does not require extracting cores (e.g., in the case of non-destructive methods) then the output shall provide SOC averaged over the 0-30 cm layer.
Monitoring frequency:	One time at time moment t_0
QA/QC procedures:	Quality control/quality assurance (QA/QC) procedures prescribed for accredited laboratories 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:	C_{sp,t_n}
Data unit:	%
Used in equations:	3

Description:	Organic carbon concentration at sampling plot, in sampling round occurring in year t_n
Measurement procedures:	All methods used by accredited analytical laboratories are allowed, but the use of dry combustion method is recommended. If the field implemented technology to measure SOC does not require extracting cores (e.g., in the case of non-destructive methods) then the output shall provide SOC averaged over the 0-30 cm layer.
Monitoring frequency:	As required in the applicable methodology
QA/QC procedures:	Quality control/quality assurance (QA/QC) procedures prescribed for accredited laboratories are applied. In the absence of these, QA/QC procedures from published handbooks, or from the IPCC GPG LULUCF 2003, may be applied

4.3. Monitoring of Tool Implementation

43. Information shall be provided in the project submission form (PSF), to establish that the commonly accepted principles and practices of soil organic carbon 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	DD/MM/2024	Initial adoption by GCC Regulatory Committee based on following: <ul style="list-style-type: none"> i. Consideration by an individual Regulatory Committee member, followed by evaluation of entire Regulatory Committee. ii. XX days global stakeholder consultation taken place between DD/MM/2024 to DD/MM/2024

DRAFT

