Climate project methodology № 0003

CHANGES IN SOIL ORGANIC CARBON STOCKS FROM CROPLAND

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Contents

1. Terms and definitions

Baseline scenario - hypothetical development reference that best represents the conditions most likely to arise in the absence of a GHG project.

Carbon unit - verified result of the implementation of the climate project activities, expressed in the mass of greenhouse gases equivalent to 1 ton of carbon dioxide

Climate project (greenhouse gas project) – a set of measures ensuring the reduction (prevention) of anthropogenic greenhouse gas (GHG) emissions or an increase in the absorption of greenhouse gases compared to the baseline.

Crediting period – the period in which verified and certified GHG emission reductions or increases in net anthropogenic GHG removals by sinks attributable to a climate project activity, as applicable, can result in the issuance of carbon units. The time period that applies to a crediting period for a climate project activity, and whether the crediting period is renewable or fixed, is determined in accordance with Section 4 of this methodology.

Global Warming Potential (GWP) - coefficient establishing the degree of impact of the emissivity of one-unit mass of a particular GHG in the current state of the atmosphere relative to the corresponding unit of carbon dioxide over a given period of time.

Greenhouse gas project proponent (GHG project proponent (PPs)**)** – individual or organization that has overall control and responsibility for a GHG project.

IAs - intervention areas

Monitoring - continuous or periodic evaluation of GHG emissions, GHG removals, or other GHG-related data

MW_{CO2} - ratio of molecular weights of CO2 and C (44/12), tonne-CO2 $(t\text{-}C)^{-1}$

MW_{N2O} – ratio of molecular weights of N2O and N (44/28), tonne-N2O $(t\text{-}N)^{-1}$

Project proponent (PPs) - individual or organization with overall control and responsibility for the greenhouse gas emissions project.

Project activity - the specific set of measures and/or technologies applied to the project, that alter the conditions identified in the baseline scenario and which result in GHG emission reductions or removals.

Project scenario - expected level of GHG emission reduction or GHG removal increase, different from the baseline scenario, that will be achieved as a result of the project activity.

Project territory - the geographic area where the project activities are implemented.

SALM - sustainable agriculture land management

SOCBL - soil organic carbon in the eligible project area before the project start

Soil organic carbon (SOC) - carbon contained in soil organic matter.

SSM – sustainable Soil Management

Wetlands – areas of raised and low-lying bogs, peatlands or water bodies - natural or artificial, permanent or temporary, standing or running, fresh, brackish or saline, including sea areas, the depth of which at low tide does not exceed six meters

2. Scope and applicability

Cropland management modifies SOC storage to varying degrees depending on how specific practices influence C input and output from the soil system. The main management practices that affect soil C stocks in croplands are the type of residue management, type of tillage practices, fertilizer management (both mineral fertilizers and organic amendments), choice of crop and intensity of cropping management (e.g., continuous cropping versus crop rotations with periods of bare fallow), irrigation management, and mixed systems with cropping and pasture or hay in rotating sequences. In addition, drainage and cultivation of organic soils reduce soil C stocks. Land-use change and management activity can also influence SOC storage by changing erosion rates and subsequent loss of C from a site. Methodology for the estimation of SOC stocks is based on direct measurements from field samplings. However, the estimate of the future variation of SOC stocks shall be made using SOC models.

This methodology is applicable to projects that introduce sustainable agriculture land management practices (SALM) (including soil conservation agriculture) into an agricultural landscape subject. SALM involves a holistic approach to achieving productive and healthy ecosystems by integrating social, economic, physical and biological needs and values, and it contributes to sustainable and rural development. Implementing the project, the project scope should include an assessment of CO_2 and N_2O (direct and indirect emissions of N_2O) emissions and met the following condition:

a) Geographic location:

• Projects are eligible in all regions of Russian Federation. Some SOC Activity Modules may be limited by geographic condition, which shall be taken into account as part of the applicability by PPs.

b) Project area:

• As a suitable area for the project are agricultural fields, annually used for cropland, crops, including steam (except rice cultivation). Also used for crops of perennial grasses, annually used for fodder and direct grazing. The project activity shall take place on the same parcel of land as the baseline. Climate project shall be applicable to agricultural enterprise scale in defined intervention areas (IAs). Each IA may involve one or several fields either within one individual farm or on different farms owned or operated by the same or different companies that are part of the same project. If one part of the project area is materially different from another, more than one IA shall be defined due to the increased likelihood of detecting SOC and GHG emissions changes in homogeneous IAs. Material differences in soil type, land use, land-use history and landform all affect SOC stocks and, thus, shall trigger the delineation of separate IAs.

- The project does not occur on wetlands.
- The project does not occur on forest areas.
- The project does not occur on infrastructure areas.
- The climate project cannot be implemented in the abandoned areas of agricultural land subject to plowing.

c) Site preparation:

• No biomass burning for site preparation is allowed in the project. According to the item 185 of the Decree of the Government of the Russian Federation from September 16, 2020 № 1479 "About the statement of Rules of a fire-preventive regime in the Russian Federation" burning of stubble, crop residues and campfires on fields is not authorized.

d) Water regime:

• Project activities shall not include changes in surface and shallow (<1m) soil water regimes through flood irrigation, drainage or other significant anthropogenic changes in the groundwater. If the application of fertilizers is expected during the project activity, then it should not be the application of extremely high doses of mineral and organic fertilizers, which can lead to an increase in surface and subsoil flushing of nutrients (nitrogen) into surface and ground waters with further eutrophication of water bodies.

e) Land use:

• Managed cropping systems (e.g. single crop or crop rotation) must have been in place for at least 5 years prior to the project start.

• The project activity shall not lead to land use change.

Croplands at the start of the project shall show the potential for reduce SOM reduce SOM losses or contribute to its accumulation in their soil organic carbon stock after the adoption of SSM practices (compared to baseline of the project), by either gaining or maintaining SOC levels.

f) Food security:

• No reduction in crop yield which can be attributed to the project activity shall be allowed. Activities in the project area shall deliver a yield at least equivalent to the baseline yield (five-year average, prior to the project start). If regional crop productivity changes (e.g. due to climatic factors), yield in the project area shall not decrease significantly (5%) more than yield in the project region.

During the implementation of project activities, a decrease in crop yields is not allowed. Farms should maintain their income from production at least at the level before the start of the project. In case of changes in crop yields due to external causes (e.g. climate factors), the level of yield in the project area should not be significantly reduced (by 5%), compared to the rest of the arable areas of the project region:

Quantification of yield changes should be carried out taking into account the following factors of direct impact on soil organic carbon content and emissions by the project:

- Inputs mineral fertilizers;
- Change in hydrology, e.g. due to irrigation, draining and seasonal shift in crop coverage
- Change in crop-related inputs, including plant residue and N-fixation
- Change in technical management of crop (e.g. machine use for planting, treatments and harvest)
- Seasonal change in crop management activities (e.g. harvesting, fallow periods, season without vegetation cover)

Market leakage risks

- Change in crop revenues (outside the normal market price variations)
- Change in crop yield (total yield) (outside of normal variation) expressed in mass (tons) and with relation to calorific value and end-user (crops for animal/human use).

In case if the territory within the project boundary as specified in this methodology are owned by different legal entities (or are under the operational management of different legal entities), then the project documentation should include a description of procedures for eliminating the possibility of double counting in GHG emission reductions potentially achieved as a result of project activities, enshrined in contractual agreements.

3. Baseline methodology

The baseline[1] is set conservatively[2] for a business-as-usual activity, taking into account all existing policies and measures, but not considering additional project activities (Business-as-usual model).

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[1] Greenhouse gas baseline, GHG baseline - quantitative reference(s) of GHGemissions and/or GHGremovals that would have occurred in the absence of a GHG project and provides the baseline scenario for comparison with project GHG emissions and/or GHG removals (ISO 14064-2:2019 Greenhouse gases - Part 2)

The project developer may use one of the following approach to determine the baseline with justification for the appropriateness of the choices[3]:

An approach based on existing actual or historical emissions, adjusted downwards by at least 5% unless otherwise specified in the project Methodology.

The approaches above provide a framework for a general understanding of the ways to define baselines. A detailed approach to determining the baseline for this type of project is provided in Section 3 «Baseline Methodology».

The project proponent (PPs) should consider all potential baseline scenarios that include the proposed project as a potential baseline scenario.

When developing a baseline, the project proponent must select and justify assumptions, values, and procedures that ensure that GHG emission reductions or GHG uptake increases cannot be overestimated, select or develop, justify, and apply criteria and procedures to demonstrate that the project results to reduce emissions or increase GHG uptake are additive to existing ones compared to the defined baseline.

At the start of the project, PPs shall make the baseline scenario shall be determined by identifying conditions:

- ✓ the land use and management practices that were in place during the five years prior to the intervention;
- ✓ regional conditions: the land use and management practices that represent the typical in the project region;

The identified practices scenario must be realistic and credible on the basis of verifiable information sources, such as national agricultural statistics reports, documented public management records of land users, published peer-reviewed studies in the project region, results of surveys conducted by or on behalf of the project proponent prior to the initiation of project activities.

The baseline scenario definition is based on the provision of five-year historic activity data to be assessed, including:

- ✓ cash and cover crops per year (approximate sowing and harvest dates), and harvested yields or biomass (kg DM/ha/yr);

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[2] Calculation of the baseline is considered conservative if the final estimate of emission reductions resulting from project activities will not be overestimated. If there is any doubt, the project developer should better understate the baseline projection.

[3] Approaches to determining baselines are given in Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its third session (FCCC/PA/CMA/2021/10/Add.1, Article 6, paragraph 4, p. 34, para. 36). URL: https://unfccc.int/sites/default/files/resource/cma2021_10a01E.pdf.

- ✓ residue management; assessment of removal and return of residues (percent or kg DM/ha/yr);
- ✓ tillage practices (tillage system, number and type of tillage operations per year) annual mechanized farm operations
- ✓ tillage, planting, pest control, fertilizer/organic and inorganic amendments/manure application and distribution, harvesting, mowing, baling hay, internal transportation and other operations;
- ✓ fertilizer and inorganic amendment use (product, application method, moment/of application, fertilizer and nutrient doses per year in kg/ha);
- ✓ organic amendment uses (type, form of application, placement method, timing and application rate per year);
- ✓ annual fuel consumption for all of the above activities;
- ✓ irrigation annual fossil fuel consumption.

3.1 Estimation of SOC baseline

For each eligible area of the project baseline SOC stocks shall be quantified using the following approaches:

1. Soil organic carbon stock (t C/ha) at 0-30 cm shall be projected SOC simulation models for a 20-year period, using experimentally measured biochemical indicators and historic data as inputs for the model for the previous 5 years. The baseline based on historical data takes into account periods of biogeochemical cycles of carbon and nitrogen in cropland soils. A minimum projection of 20 years is required in order to allow comparisons and harmonization of different projects. Standardized baselines shall be established at the highest possible level of aggregation in the relevant sector.

Soil organic C models are capable of simulating soil organic C dynamics under different land uses, climatic conditions and management practices. These include for example models such as RothC[4] or DNDC[5], or the stationary soil C method calculated using the IPCC Tier 2 methodology (IPCC, 2019).

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[4] RothC (Rothamsted Long Term Field Experiments Carbon Model) is a model of organic carbon (Sorg) cycling in the upper layers of automorphic soils, which takes into account the influence of soil type, temperature, moisture and vegetation cover on metabolic processes (Jenkinson et al., 1987). The model calculates changes in soil Sorg, microbial biomass, and CO2 emissions from soil. It can be used in a wide range of climatic zones and environmental conditions.

If there is reliable evidence that soil C stocks in the project area are in a steady state under conventional practices, then only the average initial soil C stocks can be measured as a baseline.

2. The content of the basic level of organic carbon in the soil (SOCBL), as well as other parameters for the application of SOC models are measured in pre-selected according to the national standard GOST R 58595-2019, approved and enacted by Order of the Federal Service for Technical Regulation and Metrology of October 10, 2019 № 954-st soil samples using national measurement methods. The method of measurement of the SOC should be the same throughout the all credit period of the project.

Baseline SOC stocks are calculated as the sum of stocks multiplied by the area in the baseline for each periods of monitoring over the creditation periods (5, 10, 15 years after the project activities start using in Equation 1).

Equation 1

$$SOCBL=\Sigma(SOCBL,y\times Ay)$$

Where:

SOCBL	soil organic carbon baseline level [tC]
SOCBL,y	soil organic carbon in stratum y without project implementation [tC ha-1]
Ay	area of stratum y [ha]

3.2 Estimation of baseline of fossil fuel combustion

Emission of CO_2 from combustion of fossil fuels before project start is carried out according to the Methodology of quantification of greenhouse gases emissions, approved by order of the Ministry of Natural Resources of Russian № 371 from 27.05.2021, calculated as Equation 2. The emissions from the total mass consumption of fossil fuel by vehicles involved in the implementation of mechanized activities during the full calendar year on the fields included in the zone of project activity are estimated. The baseline takes into account the annual fuel consumption for all activities according to the collected data for the previous 5 years of activity.

The emissions of CH4 and N2O from fossil fuel combustion in agricultural activities are considered negligible (less than 5 %) and are not counted in total emissions.

[5] DNDC (DeNitrification-DeComposition) is a simulation model of carbon and nitrogen biogeochemistry in agroecosystems. The model can be used to predict crop growth, soil temperature and moisture regimes, soil carbon dynamics, nitrogen leaching and microgas emissions including nitrous oxide (N2O), nitrogen oxide (NO), nitrogen (N2), ammonia (NH3), methane (CH4) and carbon dioxide (CO2).

Equation 2

$$\textbf{Cfuel} = \sum_{k=0}^{n} Vk \times EFk$$

Where:

Cfuel	CO_2 emissions from fuel combustion in vehicle/equipment type before project start, [tonn CO_2]
Vk	amount of fuel k combusted in vehicle/equipment type before project start, [thousand m3]
EFk	coefficient of CO_2 emission from fuel combustion k Default values of the coefficients are given in Table 1.1 of the Methodology for Quantification of Greenhouse Gas Emissions, approved by order of the Ministry of Natural Resources of Russia No. 371 of May 27, 2021.

3.3 Estimation of baseline N_2O emissions

The total amount of N_2O emissions of a given farm or installation (t N_2O-N yr-1) is calculated as follows before project start use Equation 3:

Equation 3

$$N_2O_{total} = N_2O_{direct} + N_2O_{indirect}$$

Where:

N_2O_{total}	total amount of N_2O-N emissions in the project area before project start [t N_2O-N yr^{-1}]
N_2O_{direct}	annual direct N_2O–N emissions produced from managed soils in the project area before project start [t N2O–N yr-1]
N_2Oindirect	amount of N_2O-N emissions from volatilization or from leaching and runoff in the project area before project start [t N_2O-N yr-1]

Estimation N_2O direct emissions before project start is calculated as follows:

Equation 4

$$N_2O - N_{direct} = N_2O\text{-}N_{\ Ndirect} + N_2O - N\ os$$

$$N_2O\text{-}N\ Nincoming = [(F_{SN} + F_{CR} + F_{SOM} + F_{ON}) * EF_1]$$

Where:

N_2O - Ndirect	annual direct N_2O – N emissions of managed soil before the before project start
N_2O-N Nincoming	annual direct incoming N_2O – N emissions from anthropogenic application of nitrogen to managed soil before project start
N_2O – N os	annual direct N_2O – N emissions of organic managed soil before project start ,[kg N_2O-N /year]
F_{SN}	annual amount of mineral fertilizer nitrogen applied to soils before project start , [kg N/year]
F_{CR}	annual amount of nitrogen in crop residues (above-ground and underground) of cultivated plants, including from nitrogen-fixing crops and from renovation/restoration of forage crops, returned to soils before the project start, [kg N/yr]
F_{SOM}	annual amount of nitrogen in mineral soils that is mineralized due to loss of carbon from soil organic matter as a result of changes in land use or changes in soil management practices before the project start, [kg N/yr]
F_{ON}	annual amount of manure, compost and other organic nitrogen-containing additives applied to soils before project start, [kg N/year];
EF_1	N_2O emission factor from anthropogenic application of nitrogen to soils, [kg N_2O-N / kg incoming N]

Default coefficient values for direct N_2O emissions from cultivated soils are given in Table 2.1, and a detailed description of the assessment of each source of nitrogen input to cultivated soils is given in sections 2.1.1 and 2.1.2 of Methodology Recommendations for Voluntary Inventory of Greenhouse Gas Emissions in Constituent Entities of the Russian Federation. Order of the Russian Ministry of Natural Resources and Environment of 16.04.2015 № 15-r. Annex 1 Part IV- M., 2015. 30 c.

In addition to direct N_2O emissions from managed soils, the PPs needs to consider indirect emissions.

There are two ways of indirect N2O emissions:

1. From the volatilization of nitrogen as NH_3 and nitrogen oxides (NOx) and the deposition of these gases and their products $NH4^+$ and $NO3^-$ on soils and surfaces of lakes and other water bodies.

2. As a result of leaching and runoff from land of nitrogen from mineral and organic fertilizers and crop residues, mineralization of nitrogen associated with soil carbon losses in mineral and drained/treated organic soils as a result of land-use change or management practices.

Estimation N_2O indirect emissions as a result of volatilization of nitrogen before the project is calculated as follows:

Equation 5

$$N_2O_{(ATD)} - N = [(F_{SN} * Frac_{GASF}) + (F_{ON} * Frac_{GASM})]*EF_4$$

Where:

$N_2O_{(ATD)} - N$	annual amount $N_2O - N$ which is formed as a result of atmospheric deposition of nitrogen that escaped from cultivated soils before the before the project, [kg N_2O-N /year]
F_{SN}	annual amount of mineral fertilizer nitrogen applied to soils before the project, [kg N/year]
$Frac_{GASF}$	portion of mineral fertilizer nitrogen that escapes as NH_3 and NOx before the project start, [kg escaped N/kg applied N]
F_{ON}	annual amount of nitrogen in the composition of properly prepared and applied to the soil manure, compost (without the addition of manure) and other organic nitrogen-containing additives before the project star, [kg N/yr];
FracGASM	part of the nitrogen from applied organic nitrogen fertilizers (F_{ON}), which volatilizes as NH_3 and NOx before the project star, [kg volatilized N / kg of N applied or left behind]
EF_4	N_2O emission factor as a result of nitrogen deposition from the atmosphere to the soil and water surfaces, [kg N_2O-N/ kg of volatilized NH_3-N + NOx-N]

Estimation N_2O indirect emissions as a result of leaching of nitrogen before the project start is calculated as follows:

Equation 6

$$N_2O_L\text{-}N = (F_{SN} + F_{CR} + F_{SOM} + F_{ON})* F_{racLeach\text{-}(H)} *EF_5,$$

Where:

N_2O_L-N	annual amount of N2O-N formed as a result of leaching and runoff of anthropogenic nitrogen compounds into cultivated soils before the project start, [kg N_2O-N /year]
F_{SN}	annual amount of mineral fertilizer nitrogen applied to soils before the project, [kg N/year]

F_{CR} annual amount of nitrogen returned to soils with crop residues (above-ground and underground), including from nitrogen-fixing crops and feed crop renovation/restoration before the project implementation, [kg N/year]

F_{SOM} the annual amount of nitrogen mineralized in mineral soils due to the loss of soil carbon from soil organic matter as a result of changes in land use or management of cultivated land before the project starts, [kg N / year]

F_{ON} annual amount of nitrogen in the composition of properly prepared and applied to the soil manure, compost (without the addition of manure) and other organic nitrogen-containing additives before the project start, [kg N/yr];

$F_{racLeach-(H)}$ fraction of all N added to treated soils or mineralized in treated soils that is lost through leaching and runoff before the project start, [kg N / kg N additive]

EF5 N_2O emission factor from leaching and nitrogen runoff, [kg N_2O-N / kg N leached and runoff]

The values of indirect emission, volatilization and leaching coefficients are given in Table 2.3. Methodological Recommendations on Voluntary Inventory of Greenhouse Gas Emissions in the Constituent Entities of the Russian Federation. Order of the Russian Ministry of Natural Resources and Environment of 16.04.2015 № 15-r. Annex 1. Part IV - M., 2015. 30 c. Conversion of N2O - N emissions into N2O emissions is calculated using Equation 7.

Equation 7

$$N_2O = N_2O - N * 44/28$$

Detailed descriptions of emissions from each source, as well as emission factors, are given in the IPCC National Greenhouse Gas Inventory Guidelines (IPCC, 2006).

Total baseline stocks of GHG in $tCO_2\ yr^{-1}$:

Equation 8

$$GHG_{total} = SOCBL * MW_{CO2} + N_2O_{total} * GWP_{N2O} + Cfuel$$

Where:

GHG_{total} the total value of baseline greenhouse gas emissions

$SOCBL$ baseline soil organic carbon [tC]

$Cfuel$ CO_2 emissions from fuel combustion in vehicle/equipment type before project start, [tonn CO_2]

MW_{CO2} the ratio of molecular weights of CO_2 to C (44/12), ton-CO_2 $(t\text{-}C)^{-1}$

N_2O_{total} baseline total amount of N_2O emissions in the project area [t N_2O $year^{-1}$]

GWP_{N2O} global warming potential for N_2O, kg-CO_2-e (kg-N_2O)

Nitrous oxide emissions are converted to CO_2 equivalent by multiplying by the global warming potential (GWP) value of 298 for nitrous oxide.

4. Project crediting period

The starting date of project activities is not regulated.

A crediting period for emission reduction projects is a maximum of 10 years renewable a maximum of twice for 10 years or a maximum of 15 years with no option of renewal.

The crediting period begins no earlier than 5 years prior to applying for validation for projects validated until December 31, 2025, and no earlier than 2 years prior to applying for validation for projects validated after January 1, 2026.

The additionality and baseline shall be evaluated at the beginning of the crediting period and confirmed or reevaluated at the beginning of the next 10-year phase if the project is conducted 3 times 10 years each.

5. Additionality

Additionality shall be demonstrated using Guidelines 001 «Demonstration of the additionality of the project activity».

6. Monitoring plan requirements

PPs shall select or establish criteria for identifying sites for regular monitoring or assessment based on suitable and reliable data.

As minimum within the monitoring should identify key indicators of positive changes in the implementation of the Climate Project, and as maximum, all possible indicators for which systematic and comprehensive observations can be carried out as part of the Climate Project.

PPs of the project shall develop and implement a monitoring plan that includes procedures for measuring, namely, obtaining, recording, summarizing and analyzing data and information necessary to quantify and report changes in carbon stocks in the soil related to the project and the baseline scenario. The PPs shall explain the reason for not selecting a site identified in the baseline scenario for regular monitoring.

In order to prove that the land use and management practices assessed by the Project Developer in the baseline scenario remain adequate during the crediting period, this methodology requires setting monitoring areas for each of the project strata. Each monitoring zone covers 0.25 hectares and is allocated beyond the project boundary on an area that is as similar to the project area as possible in terms of soil type, water regime, slope, exposition, previous land use and etc.

The first examination of the monitoring area is carried out just before the start of project activities, and then repeated at least every 5 years in accordance with the monitoring plan requirements in accordance with the monitoring plan.

The data obtained during the survey of control sites are used to adjust the previously approved baseline for each verification of the project. Adjustment of the baseline is made in case of a discrepancy of more than 10% in the monitoring data in the direction of increasing the conservatism of the baseline (i.e., downward for the baseline on net greenhouse gas emissions and upward for the baseline on net removals). The adjustment uses baseline data obtained before discounting it, then applies a discount of 5%, as described in Section 3 of this methodology. If the monitoring data obtained differs from the approved baseline in the direction of its conservatism, no adjustments are applied.

Soils sampling is recommended according to the national standard GOST R 58595-2019 approved and put into effect order of the Federal Agency technical regulation and metrology 10 October 10, 2019 N 954-st. Carbon stock content of cropland is measured from a representative number of soil samples using national measurement methods.

For estimated the content of organic carbon soil samples collected from the depth of 0-10 cm and 10-30 cm, then the total calculation is carried out to a depth of 0-30 cm. Soil samples should be taken regularly, at the same time and with minimum biological activity. The sampling method for determining soil density is chosen depending on the physical properties of soils (intact method for wet soils without coarse fraction or excavated method for coarse (loose) soils.

Monitoring procedures for N_2O emissions should include the amount of nitrogen mineral and organic fertilizers applied to soils, the gross harvest and the area of crops under cultivation. N_2O emissions should be calculated on actual data and estimated according the IPCC Methodology (2006) and or to use the Methodology of the National Greenhouse Gas Emissions Inventory approved by the Ministry of Natural Resources and Environment of the Russian Federation on April 16, 2015 № 15-r "Methodological Recommendations for Voluntary Inventory of Greenhouse Gas Emissions in the Subjects of the Russian Federation". It is possible to use direct measurements comparable to the above methods of National Inventory reports or direct measurements comparable to the above.

Monitoring emissions for CO_2 from fossil fuel combustion should include total fuel consumption by all vehicles using for activities in the project area during the all year. Emissions from combustion of fossil fuels should be calculated based on the actual data collected and estimated in accordance equation 2 part 3.2.

All data collected during monitoring shall be archived in electronic form and stored for at least two years after the end of the crediting period. Monitoring should be carried out for all collected data.

Monitoring of the project area on cropland should be conducted every two years or at least once every five a year.

The monitoring plan should include the following, as applicable:

a) The purpose of the monitoring;

b) The list of parameters to be measured and monitored;

c) The types of data and information to be reported, including the units of measurement;

d) Sources of data;

e) Monitoring methodologies, including soil sampling procedure according to available national methodologies and their representativeness, evaluation, modeling, measurement, calculation approaches and uncertainty. The frequency of monitoring, taking into account the needs of the intended users;

f) Roles and responsibilities of participants related to monitoring, including procedures for authorizing, approving, and documenting changes in recorded data;

g) Control procedures, including internal validation of input data, conversions, and output data, and procedures for corrective actions;

h) GHG information management systems, including data placement and preservation, and data management, including procedures for transferring data between different types of systems or documentation.

If tools and equipment are used for monitoring procedure, the PPs shall ensure that they are properly applied, maintained and the requirements of this methodology and are comparable to IPCC methodologies and approaches.

The PPs shall apply monitoring criteria and procedures in accordance with the monitoring plan. All data and information related to project monitoring shall be recorded and documented.

PPs shall stratifies the project area by crop system, tillage system, use of crop residues, application of mineral and organic fertilizers in soils and relevant climatic variables as a minimum.

Remote, including hyperspectral, estimates of carbon stocks and/or greenhouse gas emissions can be used in the validation of the baseline and verification of achieved project results for independent confirmation of measured data, but should not be used as the only and primary method of monitoring and evaluation of quantitative project performance.

Adaptation procedures

If the monitoring of the first five years after the implementation of project activities has not revealed any significant changes in the key indicators, there should be adaptation procedures for the implementation of the climate project.

As part of the implementation of these procedures, the main causes and factors of ineffectiveness of the implemented measures should be identified, or justification should be given that this was due to reasons beyond the control of the implementer (dry years and other reasons). Based on the information obtained, additional corrective measures should be identified and re-activated.

Adaptation procedures must be carried out in accordance with the general concept of design solutions and correspond to the design documentation submitted for validation. This fact is confirmed during verification.

7. Project scenario

For all of the eligible project area, SOC stocks at time t are calculated as the sum of stocks in each stratum multiplied by the stratum area:

Equation 9

$$SOCt=\Sigma(SOCt,y\times Ay)$$

Where:

SOCt	soil organic carbon in the eligible project area at time t [tC]
SOCt,y	soil organic carbon in stratum y at time t [tC ha-1]
Ay	area of stratum y [ha]

The thickness of the layer when estimating SOC reserves in the project scenario must be equal with the thickness of the layer for the baseline scenario (30 cm).

For each eligible area of project SOC stocks shall be quantified using the one of the following approaches:

Approach 1: Estimated of SOC using the default values of emission factors according to IPCC Guidelines, 2019.

Approach 2: Using the models for estimating the SOC stock in cropland, for example RothC or DNDC models. These models estimated SOC stock at the depth of 30 cm under a particular management method on cropland. The modeling should consider only biomass inputs to the soil within the project boundary.

The PPs is encouraged to select approach for estimating SOC according to available data sources and model calculations.

The information recorded will depend on the choice of the type of activity being promoted.

If the activity is improving the use of crop residues PPs should record:

- ✓ Area of each crop (ha)
- ✓ Productivity of each crop (kg/ha)
- ✓ The amount of crop residues (kg/ha)12
- ✓ Existing crop residue management practices and their frequency
- ✓ Future crop residue management practices that will be implemented with the project

If the project activity includes improved tillage practices should record:

- ✓ Area under tillage (ha)
- ✓ Type and depth of tillage
- ✓ Existing tilling practices and their frequency
- ✓ Future tilling practices that will be implemented with the project

If the project activity includes ground cover crops should record:

- ✓ Area of ground cover crops (ha)
- ✓ Number and species of ground cover crops
- ✓ Future numbers of ground cover crops that will be implemented with the project

CO_2 emissions from fossil fuel combustion.

CO_2 emissions from combustion of fossil fuels by vehicles in the project scenario are estimated in accordance with Equation 3 of Section 3.2 above. The inputs used are the total fuel consumption of all vehicles for activities in the project area during the calendar year.

Emissions of nitrous oxide from cropland.

The main sources of N_2O:

- ✓ mineral and organic fertilizers;
- ✓ organic N applied as fertilizer (e.g., animal manure, crop residues, compost, sewage sludge, rendering waste);
- ✓ N in crop residues (above ground and below ground), including from N-fixing crops (legumes) and from forages during pasture renewal;
- ✓ N mineralization associated with loss of soil organic matter resulting from change of land use or management of mineral soils;

Emission CO_2 from consumption of fossil fuels combustion by vehicles in the project scenario estimated using Equation 3 of Section 3.2 above. As input data are used the total fuel consumption by all vehicles for activities in the project area during the calendar year.

Direct emissions and indirect emissions of N_2O.

Estimated emissions of N_2O-N shall be quantified using the one of the following approaches:

Approach 1: Using a modeling approach with models such as DNDC or CENTURY[6].

Approach 2: Estimated of N_2O-N using the default values of emission factors according to IPCC Guidelines, 2006 .

The total amount of N_2O-N emissions (kg N_2O-N yr^{-1}) is calculated as follows:

Equation 10

$$N_2O\ total = N_2Odirect + N_2Oindirect$$

$N_2Ototal$ total amount of N_2O-N emissions in the project area [t N_2O-N yr^{-1}]

$N_2Odirect$ annual direct N_2O–N emissions produced from managed soils in the project area includes mineral and organic fertilizers, crop residues and mineralization processes associated with the loss of soil organic matter due to changes in mineral

[6] CENTURY is a process model designed to simulate the dynamics of carbon (C), nitrogen (N), phosphorus (P) and sulfur (S) in natural or cultivated systems using a monthly time step. The model was originally developed in the late 1980s by Colorado State University and is now one of the most widely used soil biogeochemistry models.

soil m [t N_2O–N yr-1]

N_2Oindirect indirect emissions of N_2O-N from volatilization or from leaching and runoff in the project area [t N_2O-N yr-1]

For estimated of direct and indirect emissions in the project area the PPs should use the same equations as for baseline scenario (see section 3.2).

Total emissions of GHG in $tCO_{2-}e$ yr^{-1}:

Equation 11

$$GHG_{total} = SOC * MW_{CO2} + N_2O_{total} * GWP_{N2O} + Cfuel$$

Where:

GHG_{total}	the total value of greenhouse gas emissions
$SOCBL$	soil organic carbon [tC]
Cfuel	mass of CO_2 emissions from fuel combustion in vehicle/equipment type, [tonn CO_2]
MW_{CO2}	the ratio of molecular weights of CO_2 to C (44/12), ton-CO_2 $(t\text{-}C)^{-1}$
N_2O_{total}	total amount of N_2O emissions in the project [t N_2O $year^{-1}$]
GWP_{N2O}	global warming potential for N_2O, kg-CO_2-e (kg-N_2O)

8. Leakage assessment

According to the Order of the Ministry of Economic Development of Russia dated May 11, 2022 N 248 project activities should not lead to an aggregate increase in greenhouse gas emissions or reduce their absorption levels outside the scope of such activities.

As a possible source of leakage as a result of project activities is the potential burning of crop residues outside the project field. According to paragraph 185 of Decree No. 1479 of the Government of the Russian Federation dated September 16, 2020 "On Approval of Fire Safety Rules in the Russian Federation", burning of stubble, crop residues and making fires on the fields is not permitted. If such a spill occurs, it must be fully accounted for in project reporting documents and submitted for inspection.

9. Non-permanence risk analysis

The non-permanence risk on the cropland area is that at the end of the project may return to traditional practices and lose all the accumulated carbon. Therefore, the project implementers must provide guarantees that at the end of the project period the results will last for 100 years. If such guarantees cannot be provided, then the number of achieved emission reductions / increased uptake in the project should be discounted commensurately for the number of years that are not covered by the guarantees.

10. Methods to prevent double counting, negative impacts on the environment and society

Double counting of soil C stocks in cropland is possible when the impact of activities is not cumulative, but is calculated using independent approaches (e.g., using separate models or even separate methodologies for estimating C stocks in cropland). To avoid such effects, the methodology should consider the following rules when applying multiple activity to a single project: A project applying direct measurement to at least one activity. For soils with a measured SOC impact, the resulting difference represents the impact of all project activities, i.e., no additional model calculations are performed to increase SOC.

Climate project should demonstrate its compliance with all legal requirements in the jurisdiction where it is located. Project proponent should question whether there is a risk that their project might result in negative impacts for local communities, biodiversity and the environment. Such projects should not cause an increase in atmosphere, soil, surface and ground water pollution as well as lead to any community conflicts, land tenure issues, forceful evictions, human rights violations, or worsened health and wellbeing due to restricted access to a forest or nature area.

The project does not involve and is not complicit in significant conversion or degradation of critical natural habitats, including those that are

(a) legally protected,

(b) officially proposed for protection,

(c) identified by authoritative sources for their high conservation value

(d) recognized as protected by traditional local communities

The project respects internationally proclaimed human rights including dignity, cultural property and uniqueness of indigenous people. The project is not complicit in Human Rights abuses.

11. Update of the baseline at the renewal of the crediting period

At the renewal of crediting period the project is subject to verification with elements of validation and a technical assessment by a validation and verification body to determine necessary updates to the baseline, the additionality and the quantification of emission reductions (increase in absorption).

In order to update the baseline, the approach to its definition, the main parameters and assumptions used in the analysis are revised and updated. The baseline shall be representative of the conditions for the beginning of a new crediting period and be valid for that period.

The additionality at the renewal of the crediting period is checked for compliance to the criteria under Guidelines №001 at the date of the beginning of the new crediting period.

12. Normative references

1. Order of the Ministry of Economic Development of Russia dated May 11, 2022 № 248 "On approval of the criteria and procedure for classifying projects implemented by legal entities, individual entrepreneurs or individuals, as climate projects, the form and procedure for reporting on the implementation of a climate project" (Registered with the Ministry of Justice of Russia on May 30, 2022 № 68642)
2. GOST R ISO 14064-1-2021. National Standard of the Russian Federation. Greenhouse gases. Part 1. Requirements and Guidance for Quantification and Reporting of Greenhouse Gas Emissions and Absorption at the Organization Level (approved and enacted by Rosstandart Order No. 1029-st dated 30.09.2021);
3. GOST R ISO 14064-2-2021. National Standard of the Russian Federation. Greenhouse gases. Part 2. Requirements and Guidelines for Quantification, Monitoring and Reporting Documents for Projects to Reduce Greenhouse Gas Emissions or Increase Their Absorption at the Project Level (approved and enacted by Order No. 1030-st of Rosstandart dated September 30, 2021);
4. GOST R ISO 14064-3-2021. National Standard of the Russian Federation. Greenhouse gases. Part 3. Requirements and Guidance for Validation and Verification of Greenhouse Gas Statements (approved and enacted by Rosstandart Order No. 1031-st of 30.09.2021);
5. GOST R ISO 14065-2014 National Standard of the Russian Federation. Greenhouse gases. Requirements for greenhouse gas validation and verification bodies for their application in accreditation or other forms of recognition (approved and enacted by Order of Rosstandart of 26.11.2014 № 1869-st);
6. GOST R ISO 14080-2021. National Standard of the Russian Federation. Greenhouse Gas Management and Related Activities. System of approaches and methodological support

for the implementation of climate projects (approved and enacted by Order of Rosstandart No. 1033-st dated 30.09.2021);

7. GOST R ISO 14066-2013. National Standard of the Russian Federation. Greenhouse gases. Requirements for competence of greenhouse gas validation and verification groups (approved and enacted by Order of Rosstandart of 17.12.2013 № 2274-st);
8. Methodological Recommendations for Voluntary Inventory of Greenhouse Gas Emissions in the Constituent Entities of the Russian Federation. Order of the Russian Ministry of Natural Resources and Environment of 16.04.2015 № 15-r. Annex I. Part IV-M., 2015. 30 c.
9. Order of the Ministry of Natural Resources of Russia dated May 27, 2022 № 371 "On approval of methods for quantitative determination of greenhouse gas emissions and greenhouse gas removals" (from March 1, 2023, except for certain provisions, coming into force on March 1, 2024);
10. Order of the Ministry of Natural Resources of the Russian Federation dated June 30, 2015 №300 "On approval of methodological guidelines and guidelines for quantitative determination of greenhouse gas emissions by organizations engaged in economic and other activities in the Russian Federation" (until March 1, 2023);
11. IPCC 2006. Guidelines for National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change, 2006 / Edited by S. Iggleston, L. Buendia, K. Miwa, T. Ngara and K. Tanabe. // T.1-5. - IGES// Hayyam. 2006.
12. VCS Methodology VM0017 v 1.0 (2011): Adoption of Sustainable Agricultural Land Management. Developed by BioCarbon Fund, World Bank. (https://verra.org/methodology/vm0017-adoption-of-sustainable-agricultural-land-management-v1-0/)
13. VCS Module VMD0021 v1.0 (2011): Module VMD0021 Estimation of Stock in the Soil Carbon Pool. (https://verra.org/methodology/vmd0021-estimation-of-stocks-in-the-soil-carbon-pool-v1-0/)
14. FAO. 2020. A protocol for measurement, monitoring, reporting and verification of soil organic carbon in agricultural landscapes – GSOC-MRV Protocol. Rome. https://doi.org/10.4060/cb0509en
15. Global Standard for the Global Goals Soil Organic Carbon Framework Methodology Version1.0

https://globalgoals.goldstandard.org/standards/402_V1.0_LUF_AGR_FM_Soil-Organic-Carbon-Framework-Methodolgy.pdf

16. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 4 Agriculture, Forestry and Other Land Use (https://www.ipcc-nggip.iges.or.jp/public/2019rf/vol4.html)

16. Decree of the Government of the Russian Federation of 16.09.2020 No. 1479 (revised on 24.10.2022) "On Approval of the Rules of the Fire Prevention Regime in the Russian Federation" https://docs.cntd.ru/document/565837297.

Appendix 1 Examples of key practices that can be implemented for sustainable soil management

a) minimizing tillage;

b) balanced use of mineral fertilizers;

c) optimization of organic fertilizers use (manure, plant residues, compost, digestates (material remaining after anaerobic digestion of biodegradable raw materials), biochar (pyrocoal);

d) optimization of the use of inorganic fertilizers (limestone, gypsum for sour soils, gypsum for alkaline soils);

e) use of biological preparations and microorganisms (mycorrhizae, phosphate-solubilizing bacteria, bioinoculants, biostimulants);

f) management of plant residues (mulching or permanent soil covering);

g) cultivation of cover crops, use of green fertilizers or perennial crops in the crop rotation;

h) optimized water management to increase biomass;

i) control of soil compaction (coordinated movement of machinery across the field; use of perennial plants with a tap root system as "bio-drills"; no-tillage);

* Types of plants "bio-drills": Alfalfa, clover, woody plants, berry bushes, rape, fodder radish, radish, beet, wild saffron, winter rape, saffron, sunflower, yellow mustard.

j) diversification and use of crop rotations, combined use of different practices: agroforestry, integrated with pastures and arable land.

k) Erosion control through terracing, surface water management and control of drainage systems;

m) targeted planting of autochthonous (native) plants, proven to restore soil structure and soil microbiota