CARBON REMOVALS EXPERT GROUP TECHNICAL ASSISTANCE

Peatlands – Technical Assessment Paper

11 September 2024

Partners for Innovation B.V. (PfI)
Withoedenveem 8
1019 HE Amsterdam
The Netherlands

Wageningen University and Research
Wageningen Environmental Research (WEnR)
Droevendaalsesteeg 3
6708 PB Wageningen
The Netherlands

Contact persons:
Peter Karsch, Partners for Innovation B.V.
Tel. +31-20-6200511 / +31-6-20607579 (mobile), e-mail: p.karsch@partnersforinnovation.com

Contact persons:
Jeroen Veraart, Wageningen Environmental Research
Jasmijn Sybenga, Partners for Innovation B.V.
Paul Mathijssen, Wageningen Environmental Research

Contents

Executive Summary table

Background and objective

The Carbon Removals Certification Framework (CRCF) proposal will set out a voluntary EU-wide framework to certify carbon removals and soil emission reductions in Europe. It focuses on criteria to define high-quality carbon removals and soil emission reductions, and addresses the processes to monitor, report and verify the authenticity of these removals and reductions. The EU carbon removal certification framework will ensure transparency, environmental integrity, and prevent negative impacts on biodiversity and ecosystems. The objective is to provide assurance about the quality of the carbon removals and emission reductions and make the certification process reliable and trustworthy to combat greenwashing. This Technical assessment paper discusses criteria and methods that can contribute to this for carbon farming activities on 'Peatland'.

Approach

The input for this technical assessment paper is based on i) the CRETA review on carbon farming methodologies (July 2023), ii) reports and scientific articles, iii) input from the Technical Focus Group discussions and iv) input from relevant research programs. In the process of developing this Technical Assessment paper for agricultural land, CRETA acquired expert input from experts on specific topics. The Focus Group members were subsequently asked to provide in-depth knowledge and their views on the three Technical Assessment papers regarding the advantages and disadvantages of different certification approaches during thematic meetings based on the quality criteria of: quantification; additionality; storage, monitoring, and liability; and sustainability. The experts participating in the Focus Groups were selected by CRETA and DG CLIMA in close consultation with the Expert Group on Carbon Removals.

Read instructions for the summary table

The executive summary table below provides for each section the most important topics that were addressed in the Focus group meetings. For each topic, preliminary findings and next steps are described. The last column with colours gives an indication if the findings were supported by a clear consensus in the Focus group (green). In case of some doubts or partial consensus, yellow was used; orange was used for topics that required further elaboration before a decision can be made.

DEFINITION OF CARBON REMOVAL ACTIVITIES				
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
2.2	**Rewetting of peatlands to develop natural values**	All rewetting activities that lead to emission reduction or carbon removal are certifiable. • Rewetting drained peatlands to restore (natural) peatlands. • Rewetting combined with additional non-hydrological measures such as measures to avoid erosion in sloping peatlands/fens or measures to stimulate the re-establishment of native vegetation	Detailed guidance on rewetting (full or partial) and taking account of the different types of peatland/wetlands	
2.3	**Peatland rewetting while maintaining present agricultural use**	Can work in short-term but unlikely to be applied on a large scale. Could be a step towards paludiculture? • Peatland rewetting while retaining an intensive agricultural function (pasture, arable). • Peatland rewetting combined with the extensification of the present agricultural function.	Need more info on to what extent this works in practice and can be applied.	
2.4	**Peatland rewetting with conversion to paludiculture**	With paludiculture, peatlands are kept productive under permanently wet, peat-conserving and potentially peat-forming conditions. Two main categories: • Cropping (cattails, peat moss, duckweed fern, cranberries, reeds, willows, and wild rice) • Forestry/agroforestry: tree species that can grow under waterlogged conditions.	Need to develop more detailed guidance in particular on the forestry/agroforestry aspect.	
2.5	**Other uses of peatland** *e.g., ending mining activities or covering peat with clay or silt*	Not discussed in detail during the focus groups	Need further discussion, research	
QUANTIFICATION				
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
3.2	**Quantification approaches for soil**	Hybrid approach combining direct measurements, modelling, and remote	Identify the right level of prescriptiveness of	

	carbon stock changes	sensing. Peat accumulation very slow, so better to check fluxes not stocks. Indirect measurements could use the correlation of vegetation composition and water table dynamics as indicator for GHG dynamics. Set out criteria on transparency and accuracy of measurements rather than imposing forward specific measurement techniques.	the methodology and develop the MRV rules. Financing of direct measurement (flux towers) needs to be further discussed.	
3.3	**Quantification of the direct and indirect associated emissions**	Direct emissions: based on IPCC guidance. Indirect emissions from land use change: complex and based on uncertain assumptions. Some guidance available from existing methodologies.		
3.4.2	**Standardised baseline** *(This section was initially written by JRC)*	Hybrid approach with different types of data (national, regional, local and activity-specific data) to be incorporated in the standardised baseline. Much of the data needed is not available or harmonised yet, suggesting that could be better to apply activity specific	Work further on the concept and on collection of data	
3.4.3	**Activity-specific baseline**	Reference period covering at least start and end of crop rotation, preferable based on more than 1 year. Measurement of activity and baseline should be comparable. Data gaps: need for more accurate national data as the drainage and hydrological conditions of peat.	No consensus on how to measure activity-specific baseline: need to find balance between managing uncertainties, financial risks and providing incentives to participate. Need to tap into findings of existing Horizon projects that are working on MRV. Need more discussion on the need and frequency of updating baselines.	
3.5	**Quantification of statistical uncertainty**	Express uncertainty at the level of a programme (i.e., group of operators) to increase the level of assurance. Long-term approach needed for peatlands as short-term can create high uncertainty depending on the local conditions.	Define threshold for the probability approach.	

ADDITIONALITY				
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
4.2	**Additionality rules in case of an activity-specific baseline**	No consensus on different additionality tests (some using regulatory, others financial additionality) How to reward also continuation of a practice?	Work further on defining additionality tests, consider how to integrate a 'common practice test' Rewetting: to what extent is it always additional unless there is already legal obligation to do so? Develop a (rewarding) mechanism to continue rewetting after the carbon credit period.	
STORAGE, MONITORING AND LIABILITY				
Section	*Topic*	*Preliminary findings*	*Next steps*	*Colour*
5.1	**Minimum duration of the activity period**	Minimum of 10-20 yrs. (30yrs more recommended for peatland restoration but shorter for agricultural use)	Define more in details the activity period for different types of peatland/wetland activity. Align the duration of the activity period with the LULUCF accounting rules	
5.2	**Minimum duration of the monitoring period**	Consensus that monitoring should be the same as activity period.	Discuss this topic more in details in particular how to avoid reversal of activities.	
5.3	**Rules for liability mechanisms**	Use of collective buffer pool was favoured as it would include multiple projects and would be programme-based	Decide on thresholds for the buffer pools	
SUSTAINABILITY				
Section	*Topic*	*Preliminary findings*	*Direction for future work*	*Colour*
6.2	**Minimum sustainability requirements**	Use existing environmental legislation as a basis. Reward action rather than results.	Further define sustainability also considering regional	

		Wider co-benefits beyond environmental ones, public goods/societal value, such as intrinsic values, tourism, community connections. Perhaps smaller benefits also to people in the wider community.	situation/legislation and active involvement of the local community.	
6.3	**Monitoring and reporting of co-benefits**	Combination of data collection, remote sensing, and modelling Using existing frameworks as developed for EU environmental directives	Develop a cost-effective and scalable methodology for quantitative co-benefit monitoring	

1. Introduction

The Carbon Removals Certification Framework (CRCF) proposal will set out a voluntary EU-wide framework to certify carbon removals and soil emission reductions in Europe. It focuses on criteria to define high-quality carbon removals and soil emission reductions, and addresses the processes to monitor, report and verify the authenticity of these removals and reductions. The EU carbon removal certification framework will ensure transparency, environmental integrity, and prevent negative impacts on biodiversity and ecosystems. The **objective** is to provide assurance about the quality of the carbon removals and emission reductions and make the certification process reliable and trustworthy to combat greenwashing.

In this technical assessment paper, we discuss the potential elements of a certification methodology for **carbon removals and emission reductions for peatlands**. The report is structured according to the QUALITY criteria and the elements to be included in the certification methodologies as listed in Annex I of the CRCF proposal. For these elements, the different potential approaches are described, and advantages and disadvantages are outlined.

The input for this technical assessment paper is based on i) the CRETA review on carbon farming methodologies (July 2023)[1], ii) reports and scientific articles, iii) input from the Technical Focus Group discussions and iv) input from relevant research projects, e.g., the Soil Mission (MARVIC, MRV4SOC and Credible).

In the process of developing this Technical Assessment paper, CRETA acquired expert input from topical experts by forming three 'Focus Groups' comprising experts on the certification of carbon removals in Agriculture on mineral soils, Forestry and Peatlands, respectively. The Focus Group members were subsequently asked to provide in-depth knowledge and their views on the three Technical Assessment papers regarding the advantages and disadvantages of different certification approaches during thematic meetings based on the QU.A.L.ITY criteria. In total, four Focus Group (FG) meetings were organised in the period October 2023 – January 2024 on the following topics:

- 1st FG meeting: 06-10-2023: Carbon activities and carbon pools
- 2nd FG meeting: 24-11-2023: Quantification
- 3rd FG meeting: 08-12-2023: Long-term storage and Sustainability
- 4th FG meeting: 26-01-2024: Baselines and Additionality

The experts participating in the Focus Groups were selected by CRETA and DG CLIMA in close consultation with the Expert Group on Carbon Removals. The Expert Group was kept up to date of the progress of the Focus Groups by providing the meeting minutes and updates on the

[1] The main input in terms of methodologies included in the review originates from a survey that was conducted through the EU Survey website in April-May 2023. This covered most relevant methodologies and only few other methodologies were added to the assessment.

Basecamp platform that is used by CRETA to organise the interaction with the Expert Group members. The meetings consisted of a plenary session with a brief introduction and a breakout session for the three types of carbon farming for which Technical Assessment papers are developed, followed by a plenary session to exchange the outcomes. The breakout sessions were chaired and documented by CRETA team members, whereas DG CLIMA policy officers were present to answer any regulatory questions regarding the framework proposal. For each topic, CRETA had formulated key questions that needed to be clarified to further develop the Technical Assessment papers and formed the basis for the discussion. The outcome of the meetings is referred to in this Technical Assessment paper in the respective chapters.

It is important to note that all the discussions underpinning these papers happened before the conclusion of the co-decision process on the voluntary framework for certifying permanent carbon removals, carbon farming and carbon storage in products. As a result, some important elements that are in the provisional agreement are not reflected in the discussions. Nevertheless, the authors have tried their best to make sure that all references to the legal text are aligned with the text of the provisional agreement.

Article 8 of the CRCF Regulation requires that the methodologies should minimise the administrative burden for operators, particularly for small-scale carbon farming. This means that the trade-off between robustness of carbon removals versus the complexity of the methodology will be an important aspect in the technical assessment papers. The technical assessment papers will be used to decide on the best practices that should be included in the writing of the strawman proposals in 2024.

This document was discussed during the 4th Expert Group meeting on carbon removals and carbon farming in April 2024. In addition, the EG members had the opportunity to give feedback to the Technical Assessment Papers afterwards. This feedback is summarised in this document at the end of the respective chapters and will be used to shape the next steps in the development of the certification methodologies. This process will involve more dedicated meetings and interactions and will result in the preparation of “strawman” certification methodologies (i.e. first drafts of the certification methodologies intended to generate discussion and gather feedback), to be shared in advance of the 5th meeting of the Expert Group (in October 2024). More details on the process ahead will be given at the 4th Expert Group meeting in April.

2. Carbon removal and emission reduction activities

2.1 Outline of the chapter and definitions

This chapter is about the definition of carbon removal and emission reduction activities that should be considered under the peatland methodology of the CRCF proposal. Box 1 gives the definitions in question, assessed from the EU proposal. The tables (section 2.2-2.6) discuss what carbon farming and emission reduction activities would need to be included in the certification methodology for peatlands.

Box 1, *Definition of carbon removal and emission reduction activities.*

In the Commission's proposal for a carbon removal certification framework, 'Carbon removal' is defined as either the storage of atmospheric or biogenic carbon within geological carbon pools, biogenic carbon pools, long-lasting products and materials, and the marine environment, **or the reduction of carbon release from a biogenic carbon pool to the atmosphere**. This definition therefore includes reductions resulting from management activities such as peatland rewetting, which reduces the release of carbon from organic soils to the atmosphere and water, and in the long-term may result in net carbon removal. Figure 1 shows the peatlands carbon cycle in rewetted (above) and drained conditions. The figure illustrates that rewetting changes the relative ratio of CO_2 and CH_4 emissions from the drained scenario of high CO_2 and exceptionally low CH_4 emissions to one where there is much less net CO_2 loss, or even net uptake, but some of that is negated by CH_4 emissions under increasingly wet scenarios. As such it is important to avoid temporary or permanent inundation as much as feasible as then the balance tips towards excessive CH_4 emissions. Sequestration takes places only under anoxic conditions, while in the oxic layer oxidation takes place.

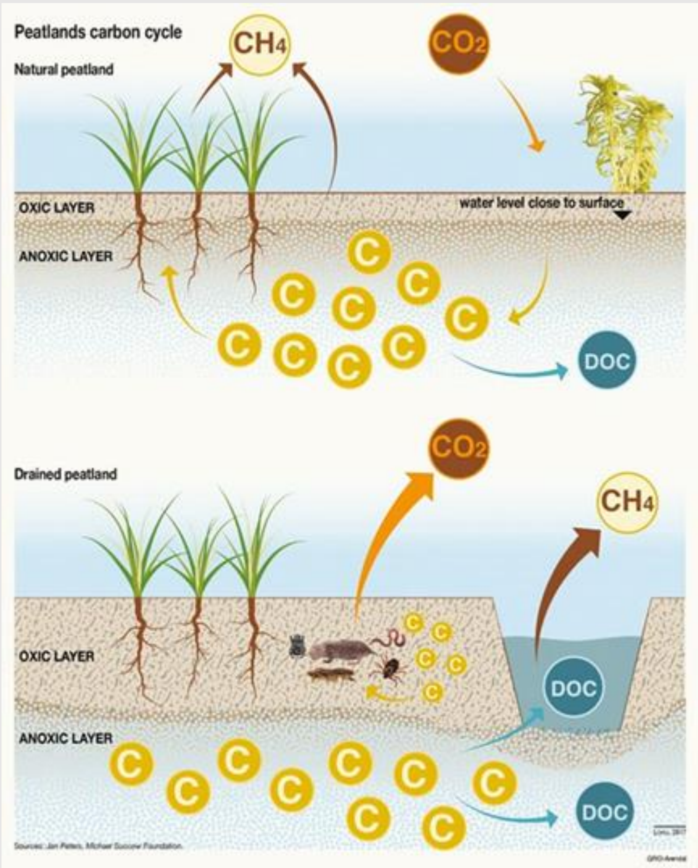

Figure 1. *The peatland carbon cycle in rewetted (top) and drained (bottom) systems in a nutshell (Source: GRID ARENDAL/Nieves Lopez Izquierdo). C= captured carbon; DOC = Dissolved Organic Carbon.*

Peatlands
The CRCF proposal does not provide an explicit definition for the term peatland. Peatlands are ecosystems with a peat soil formed from plant material that has only partially decomposed due to water saturated soil conditions. Peatland is a general term for land with a naturally accumulated layer of peat near the surface. Peatlands include both ecosystems that are actively accumulating peat, and degraded peatlands that no longer accumulate but lose peat. The definition of peatland used in this technical assessment paper is consistent with the definition established by the Ramsar Convention on Wetlands (UNEP, 2022). The term peatland is a general term for any terrain dominated by peat to a depth of at least 30 cm, it should be noted that different values for the minimum depth are used in different countries to define the difference between peatland and peaty soils (IPCC, 2014; chapter 1). This is important to consider when combining activity data for certification from different countries.

Peatland types
Different types of peatlands can be defined based on hydrology, soil and vegetation. When a peat layer, of certain depth, is present we speak about a peatland, even if it has been drained and is hence not accumulating anymore. A peatland that is still capable of forming new peat is called a mire. A bog is a mire that obtains all its water solely from precipitation, and its water table is often situated above the groundwater table of the surrounding landscape. A fen gets part of its water from the surrounding mineral soil (groundwater) or from surface water. Most peatland types in Europe include, but are not limited to raised bog, blanket bog, poor fens, and rich fens. When certifying emission reductions and carbon removals, a distinction is sometimes made between different peatland types in the reviewed certification methods.

Rewetting
The CRCF proposal does not provide a definition of rewetting. Definitions derived from literature include:

The process of changing a drained soil into a wet soil. A rewetted soil is a soil that has formerly been a drained soil but as a result of human intervention has become a wet soil. Restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. In the case of drained former wetlands, restoration always has to include rewetting (IPCC, 2014).

In agricultural sciences the term 'water logging' is used, defined as excess water in the rooting zone accompanied by anaerobic conditions leading to reduced CO_2 emissions and on the short-term to increased emissions of methane.

Many certification methods also recognise projects in which only partial rewetting is achieved as eligible for certification, because partial rewetting also leads to lower greenhouse gas emissions. However, in these cases the peat layer continues to disappear due to oxidation. The certification methods that include partial rewetting do specify minimum preconditions for rewetting, expressed as water table relative to the surface during the growing season. These preconditions differ per method.

Carbon stock change, emissions, and emission reduction
Not everyone has the same view on concepts such as greenhouse gas emissions (CO_2, CH_4, N_2O), fluxes, and changes in carbon stocks when the definitions and the objectives of the CRCF proposal are interpreted. The following points may lead to confusion:

- Not only the carbon cycle (CO_2, CH_4) but also other biochemical cycles (N_2O) play a role in the contribution of peatlands to climate policy objectives.
- The CRCF proposal defines soil emission reduction as the "*reduction of net GHG emissions from biogenic carbon pools,*" such as the organic matter stored in peatland soils. In which the focus on *carbon pools* leads to confusion on the inclusion of other than carbon-based greenhouse gases in CRCF. Consequently, during the focus group discussions varying possible policy objectives for CRCF were discussed, upon which the design of the certification method is dependent:
    - To reduce or limit the warming effect of peatlands (including albedo and other effects besides greenhouse gas exchange)?
    - To reduce or limit greenhouse gas emissions from peatlands?
    - To reduce or limit carbon-based greenhouse gas emissions from peatlands?
    - To remove carbon dioxide from the atmosphere for a long time?
    - To protect or increase carbon stocks?

Peatlands store 42% of all global soil carbon (C), but currently also contribute to five percent of all global greenhouse gas (GHG) emissions due to drainage. Rewetted peatlands absorb carbon dioxide (CO_2), but also emit methane (CH_4) as water saturation inhibits the complete decomposition of the dead plant material and the plant remain accumulate as peat (GMC, 2022). However, some decomposition does occur under anaerobic conditions, resulting in the production and release of CH_4 (Günther et al., 2020). CH_4 has a much stronger climate impact than CO_2, but it remains in the atmosphere for a relatively short time—11.8 years on average—before it is converted to CO_2.

Methane emissions

In the context of peatland management, the increase in methane emissions following rewetting is often considered a short-term effect. Over time (20/30 years), as the peatland ecosystem establishes a new equilibrium, methane emissions become neglectable (GMC, 2022). The net climate impact of peatland rewetting is a subject of ongoing research, and the effectiveness of this strategy in mitigating climate change is influenced by factors such as the type of peatland and the extent of degradation.

Nitrous oxide emissions

Drained peatlands that are nitrogen-rich, are sources of nitrous oxide (N_2O) to the atmosphere, largely caused by the mineralization of nitrogen in oxic conditions. Rewetting the peat soil is likely to decrease the N_2O emissions (Liu, et al., 2020).

Carbon removal and emission reduction activities for peatlands

Converting degraded bogs and fens into actively accumulating mires that sequester net carbon (carbon removal) is complex. In addition to this, restoring the original mire biodiversity is even more complex due to climate change and drainage of the land surrounding the rewetted area.

Carbon removal by peatlands is more difficult to quantify than greenhouse gas emission reductions by activities within peatlands (chapter 3). On the long-term, environmental conditions might be attained in which peatlands are net-sequestering carbon year by year. However, on the short-term, within the considered activity periods (chapter 5), there will be high annual variation in greenhouse gas emissions, making it difficult to determine an overall net carbon removal into the soil. The experts therefore indicated that for peatlands it is likely unfeasible to assess carbon removal in a quantitative way based on simplified calculation rules in the first years after rewetting, as it is hard to estimate the process of peat accumulation which depends on climate variability, land use, soil conditions and vegetation. In other words, in case you want to determine carbon removal by rewetting of peatlands, an activity period must be chosen that is sufficiently long (chapter 5).

All eligible activities under the peatlands theme of the CRCF proposal are based on complete or partial rewetting of peatland areas. It is desirable to distinguish activities between adaptation of existing land use, land use change and application of novel land use practices. At the same time, the certification method must remain simple, with not too many categories. We have distinguished four main categories and provide options on how these four categories can be further divided. Our recommendation is not to create subcategories and to look for another way to do justice to diversity in activities. Based on the dialogue in the expert meetings it can be concluded that the following activities should be considered in certification mechanisms:

(A) Rewetting of peatlands (organic soils) with the protection, development, and restoration of natural values as the main goal. The measures may lead to conditions in which bogs and fens supply improved ecosystem functions, and ultimately may lead to the development of functioning mires. Activities that can be included:
  - Rewetting drained peatlands to restore (natural) peatlands.
  - Rewetting combined with additional non-hydrological measures such as measures to avoid erosion in fens or sloping peatlands.

(B) Peatland rewetting while retaining the present agricultural function, activities that can be included:
  - Peatland rewetting while retaining an intensive agricultural function (pasture, arable).
  - Peatland rewetting combined with the extensification of the present agricultural function (less frequent management; lower nutrient inputs).

(C) Peatland rewetting combined with the conversion to paludiculture, activities that can be included:
  - Paludiculture with the provision of ecosystem services such as nutrient removal and water retention.
  - Paludiculture focused on biomass harvesting that can be used as food or building materials. Harvested materials with an accessible economic market and price for the private operator. It should be noted that harvested material in itself is considered as a different activity by the regulation, i.e., *carbon storage in products*.

(D) Other land use changes combined with rewetting of peatlands, optional, activities that can be included:
  - Ending of mining activities
  - other

2.2 Rewetting of peatlands with a primary objective to develop natural values

In this section (rewetting) activities are discussed that have the primary objective to protect, develop and restoration of natural values combined with emission reduction or carbon removal. Also, other ecosystem services can be optimised with proposed activities such as water retention (co-benefits, section 6.3).

<table>
<tr><td>Definition</td><td>Rewetting of peatlands (organic soils) with the protection, development, and restoration of natural values as the main goal. The measures may lead to conditions in which bogs and fens supply improved ecosystem functions, and ultimately may lead to the development of peat accumulating mires. Activities that can be included:
Rewetting drained peatlands to restore functions and conditions characteristic of (natural) peatlands.
Rewetting combined with additional non-hydrological measures such as measures to avoid erosion in fens or sloping peatlands or measures to stimulate the re-establishment of peat-forming vegetation.
The improvement of the ecological functioning of bogs and fens is the main objective. Restoring the original state of the peatland is usually not the objective, as this is often not possible (Kreyling et al., 2021). Measures with the aim of ecological recovery of peatlands usually also lead to the reduction of greenhouse gas emissions and carbon removal.

These measures can be implemented on sites that either are already nature conservation sites, in land regulation, or areas that are made into nature conservation areas.</td></tr>
<tr><td>Problem</td><td>Drained bogs and fens are a net source of greenhouse gases.</td></tr>
<tr><td>Objective</td><td>Carbon sequestration can be enhanced, emissions of greenhouse gasses can be reduced, peat layers can again accumulate, by rewetting of peatlands with a conservation status and the development of new natural areas.

Also, other ecosystem services can be optimised with proposed CR-activities such as water retention, improved ecological functioning and biodiversity. After all, the CRCF proposal states also that the EU certification framework on carbon removals can play a significant role to contribute to the proposed Nature Restoration Law (NRL).</td></tr>
<tr><td>What is there already? Existing proven certification methodologies</td><td>UK Peatland Code includes in their certification: restoration of blanket bog or raised bog with an associated baseline condition of actively eroding, drained, modified bog, drained cropland, in- and extensive grassland. But also, fens with an associated baseline condition of drained cropland, in- and extensive grassland and modified fen.</td></tr>
</table>

	• **Life OrgBalt** includes semi-natural regeneration of clear-felling sites with grey alder without reconstruction of drainage systems, shifting to continuous cover forestry on peatland. • **Moorfutures** includes drained peatlands which are rewetted with the aim to reestablish natural conditions	
What are the options?	Pros	Cons
Option A: Develop certification rules for all mentioned CR activities as a cluster as a whole	Clear message to operators: all rewetting measures that lead to emission reduction or carbon removal are certifiable	It is then not easy to distinguish between the effects of full and partial rewetting
Option B: Make a distinction in the method between: - peatland types (bogs, fens), - rewetting, rewetting with additional measures. - existing nature reserves and the development of new nature reserves.	Subdivisions within the method make it possible to reward operators who go for complete rewetting and to do justice to the differences in Carbon sequestration potential associated with different peatland types.	The method will require more administration from the certifier and the operator
Summary of focus group feedback	The focus group did not explicit select on of these options because they were not presented in this way. The description of the options is a result of the discussion. *Discussion by authors:* - The review shows that differentiation in different peat areas is applied in existing methods, so that element of option B should certainly be considered. - Within the expert group, there were supporters and opponents of making a distinction between rewetting and rewetting with additional measures. - The distinction between measures in existing nature areas and the development of new natural areas was added afterwards by one of the experts. This should certainly be investigated because the costs of the activity may be higher when land is purchased.	
Open questions	-	
Next steps	Develop guidance on specific criteria for activities.	

2.3 Peatland rewetting while retaining the present agricultural function

<table>
<tr><td>Definition</td><td colspan="2">In this activity efforts are made to increase groundwater tables compared to the current situation (see section 3.4.3), while retaining the current agricultural function (pasture, arable farming).

The method <u>should</u> make distinction between complete rewetting (e.g., to waterlogged conditions) and partial rewetting (section 2.1). The realisation of waterlogged conditions is preferred above partial rewetting. This should be reflected in different values in terms of carbon credits for complete and partial rewetting. Examples of hydrological measures include blocking drainage ditches and adapting drainage systems.

It <u>may</u> also be considered to make a distinction between maintaining the existing agricultural function with and without extensification.

Carbon reduction activities that can be included:
• Peatland rewetting while retaining an intensive agricultural function (pasture, arable).
• Peatland rewetting combined with the extensification of the present agricultural function.</td></tr>
<tr><td>Problem</td><td colspan="2">Peatlands are often drained for agricultural purposes and are a source of greenhouse gases. By rewetting these emissions can be reduced.</td></tr>
<tr><td>Objective</td><td colspan="2">The reduction of greenhouse gas emissions by rewetting, while retaining the current agricultural function.</td></tr>
<tr><td>What is there already?
Existing proven certification methodologies</td><td colspan="2">• Rewetting of peat meadows is currently included in the SNK Currency for Peat, LIFE OrgBalt and Peatland Code.
• Life OrgBalt includes in their methodology:
  o Conversion of cropland used for cereal production into grassland.
  o Controlled drainage of grassland considering even groundwater level during the whole vegetation period.
  o Introduction of legumes in conventional farm crop rotation.</td></tr>
<tr><td>What are the options?</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Option A - method that makes a distinction between retaining the current agricultural function and extensification of the current agricultural function combined with rewetting.</td><td>• It is useful to reward extensification of land use combined with rewetting. The carbon credits can compensate for the loss of income due to extensification.</td><td>• You may, unintended, also award a form of intensive agriculture that, in addition to greenhouse gas emissions, also leads to other environmental impacts.</td></tr>
</table>

Option B – method that makes a distinction between partial and complete rewetting.	• With this method you can give additional rewards to activities that realise waterlogged conditions, and distinguish these from activities with partial rewetting, where peat oxidation and soil subsidence are delayed, but not prevented.	• It is more complex to organise.
Option C – a combination of A and B.	• A combination considers variability in both the economic impact and effect on emissions of activities.	• Too complex
Summary of focus group feedback	The focus group did not explicit select on of these options because they were not presented in this way. The description of the options is a result of the discussion. *Discussion by authors:* Distinction between complete and partial rewetting and rewarding extensification of agriculture is recommend being included in the final method. In our opinion, a method that combines A and B (option C) is desirable because it considers the economic impact to the operator, and it creates incentive for complete rewetting. However, care should be taken to keep the administration for certifier and operator as uncomplex as possible.	
Open questions	-	
Next steps	Develop guidance on specific criteria for activities.	

2.4 Peatland rewetting with conversion to paludiculture (cropping & forestry)

What is paludiculture?

Paludiculture is a form of agriculture or forestry that is possible in peatlands with a high groundwater level. It is a productive land use of wet and rewetted peatlands that preserves the peat soil and thereby minimizes CO2 emissions and subsidence. With paludiculture, peatlands are kept productive under permanently wet, peat-conserving and potentially peat-forming conditions. Thus, it is a blueprint for peatland carbon farming while still producing food, feed, or energy.

Cropping

Crops that can be grown include cattails, peatmoss, duckweed fern, cranberries, reeds, willows, and wild rice. Peatmoss and cattail are suitable as a substrate for growing vegetables, an alternative for peat substrates as used in horticulture. Cattail and reeds are commonly used raw materials for building materials. Cattail and duckweed fern can also be used as animal feed. It is also possible to combine aquaculture with the cultivation of reeds and cattails (Bosma, 2017). It is a form of agriculture in which direct human food production is less important for the business model of the operator. The business model is sought in other services such as production of horticultural substrates, building materials, bioenergy but also the optimization of ecosystem services such as water provision and purification, reduction of greenhouse gas emissions and added values for biodiversity.

Forestry

Paludiculture practices (cropping) can be combined with for example agroforestry consisting of forest trees. Various preconditions are needed when forestry and agroforestry are combined with paludiculture. The choice of trees must be appropriate for waterlogged conditions (i.e., after complete rewetting) and the trees should not be harvested. Certain forms of agroforestry require drainage, which in turn has a negative effect on the carbon stock of the peatland. The economic value is in the fruits of the trees and the ecosystem services they provide. It was suggested to not include afforestation on peatlands as there is evidence that afforestation does not lead to reductions of emissions (Jurasinski et al., 2023), except for complete rewetting for new trees including e.g., alder and willows as part of paludiculture.

<table>
<tr><td>Definition</td><td colspan="2">Paludiculture is a form of agriculture or forestry that is possible in peatlands with a high groundwater level. It is the productive land use of wet and rewetted peatlands that preserves the peat soil and thereby minimizes CO2 emissions and subsidence.</td></tr>
<tr><td>Problem</td><td colspan="2">Rewetting is aimed at establishing waterlogged conditions that prevent oxidative peat loss and potentially enable new peat formation.
Paludiculture is a new/recent form of agriculture that does not yet have a fully developed revenue model for entrepreneurs but is a sustainable form of agriculture. The contribution to carbon sequestration can offer a revenue model via carbon credit certification, however it is not yet often applied by farmers.
An additional issue is how certification should deal with the carbon stock within the harvested biomass and is processed in, among other things, building materials. When biomass is used for building materials, the carbon is longer retained. How should we deal with the captured carbon in the harvested biomass when certifying paludiculture activities?</td></tr>
<tr><td>Objective</td><td colspan="2">A comprehensive but reliable methodology, while minimizing administrative costs while realizing:
- An economic incentive to switch from regular agriculture to paludiculture, specifically for early adopters.
- Transparency about the allocation of carbon credits between the paludiculture sector and the sector that uses the harvested biomass (building construction).
- Co-benefits: how to deal, in financial terms, about the other ecosystem services provided by paludiculture.
- A parallel can be drawn between with the concept of Harvested Wood Products (HWP) as used in forestry. Which statistics and monitoring are necessary to measure 'substitution of carbon?</td></tr>
<tr><td>What is there already?
Existing proven certification methodologies</td><td colspan="2">• Conversion to paludiculture is currently included in SNK Currency for Peat.
• Paludiculture will be included in Peatland Code and KlimaMoor.
• Life OrgBalt already includes paludiculture with afforestation of grassland with black alder and birch;</td></tr>
<tr><td>What are the options?</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Option A: a method that makes distinction between paludiculture for maintenance of ecosystem and paludiculture for production</td><td>• In this way it is possible to make distinction between CR-activities with and without co-benefits.</td><td>• Part of the expert group is of the opinion that paludiculture should contribute to both public ecosystem services and economic production and then this subdivision is not useful.
• Is justice being done to the diversity in paludiculture?</td></tr>
</table>

Option B - Make distinction between paludiculture for cropping and forestry	• Cropping and forestry are very recognizable sectors for operators, while option A is more theoretical.	• Is justice being done to the diversity in paludiculture?
Summary of focus group feedback	The focus group (October 2023) recommended that certification tools for carbon farming activities do justice to the diversity that exists in paludiculture. On the other hand, to keep the certification manageable it is preferred to keep the number of subdivisions limited. We have identified two options for making subdivisions. But a choice has not yet been made.	
Open questions	-	
Next steps	Develop guidance on specific criteria for activities.	

2.5 Other land use changes combined with rewetting of peatlands

Ending of mining activities
Peat extraction and other mining activities also occur in Europe. Ending these activities will also reduce greenhouse gas emissions. Mined peatlands, with no vegetation cover, are typically flooded after drain blocking. Additional measures are then necessary in these old extraction areas to allow the peatland to recover properly after (complete) rewetting.

Covering peat with clay or silt
Currently, there is little known about the effect of applying sediments and silt on peatlands. This measure is considered in the Netherlands (covering peat with clay and silt from the Ems-Dollard). The removal of sediments improves the estuaries water quality by decreasing its turbidity and when used to raise agricultural peatlands it is expected to have additional benefits (Ministerie van Landbouw, Natuur en Voedselkwaliteit, 2019). One of the co-benefits mentioned is the prevention of peat oxidation because the clay blocks the peat from oxygen.

Other
There will probably be other applications for certification for other forms of land use from certifiers that are difficult to classify in the existing categories.

2.6 Feedback Expert Group on eligible activities

Experts argued that the prerequisites for eligibility, in terms of the presence of a current peat soil, should consider the varying definitions of peat soil between member states. Opinions on partial versus complete rewetting varied. Some experts suggested not to place strong emphasis on restoring waterlogged conditions, since partial rewetting also strongly reduces GHG emissions and increases the chances of successfully continuing current farm practices with reduced intensity. But others stressed that partial and complete rewetting should be distinguished in the methodologies, or that all activities which do not aim for complete rewetting are not ambitious enough and should not be eligible.

3. Quantification

3.1 Introduction

Carbon removal activities need to be measured accurately and deliver unambiguous benefits for the climate. In this technical assessment paper, the following themes about quantification are discussed:

1. Quantification of peatland carbon stock and emission changes
2. Quantification of direct and indirect emissions
3. Rules for baselines
4. Quantification of statistical uncertainty

3.2 Quantification of peatland carbon stocks and emission changes

There are several components that can be measured to quantify the greenhouse gas balance of peatland. The following carbon pools and fluxes of greenhouse gases are identified in LULUCF-reporting (EC, 2018):

Pools:

- Net carbon stock change in above-ground biomass
- Net carbon stock change in below-ground biomass
- Net carbon stock change in litter
- Net carbon stock change in dead wood
- Net carbon stock change in soil organic carbon (organic / mineral soil)
- Net carbon stock change in harvested wood products

Fluxes:

- Net CO_2 emissions/removals
- Net N_2O emissions/removals
- Net CH_4 emissions/removals
- Net CO_2-equivalent emissions/removals

In the context of carbon removal or emission reduction in peatlands the change in organic soil carbon is of most interest. Since this large stock of carbon has the potential to result in high and long-term emissions to the atmosphere. Changes in biomass, litter or mineral soil carbon are much smaller in comparison. To achieve a robust method to quantify carbon removal, we strive for a simple and affordable certification method. Of the mentioned pools and fluxes, the **fluxes of net GHG emissions/removals** are the best measurable variables (in terms of uncertainties). Here we identify the options of which pools and fluxes to measure to apply a cost-effective quantification. Existing certification methods (Annex B) are compared in their applied direct and indirect assessment methods.

Key question: Which carbon pools and fluxes are important to quantify, and how to measure these in a robust but simple and affordable way?

The following land use (change) categories from LULUCF and the calculation methods that member states use to quantify these land use changes are methodological resources for the identified relevant activities (chapter 2):

- Land converted to (other) wetland/flooded land.
- Other land use converted to peat extraction (results in increased emissions, therefore not certifiable)
- Peat extraction converted to other land use.
- Peatland management (change in hydrological regime or vegetation management)
- Wetland remaining Wetland (LULUCF)
- Draining/rewetting/flooding (LULUCF terminology) of wetlands, grassland or cropland situated at peatland (includes both rewetting while retaining agricultural function and rewetting with conversion to paludiculture)
- Biomass burning (exclusive wildfires) (results in increased emissions, therefore not certifiable)
- Forestation on peat soils

<table>
<tr><td>Definition</td><td>Carbon removal: Quantification of CR_{total}

CRtotal is the total carbon removal at the site of the carbon removal activity by either the storage of atmospheric or biogenic carbon within geological carbon pools, biogenic carbon pools, long-lasting products and materials, and the marine environment, or the reduction of GHG emissions from a biogenic carbon pool to the atmosphere.

CRtotal is to be assessed for the following activities (as per defined in focus group meeting 1):

• Rewetting of (natural) peatlands protection, development, and restoration of natural values as the main goal
• Peatland rewetting while retaining agricultural function
• Peatland rewetting with conversion to paludiculture
• Other land use change in combination with rewetting</td></tr>
<tr><td>Problem</td><td>The examined carbon certification methods for peatlands (Annex B) use project specific methods and data. The methods are tailored for the available data and modelling approaches that are available in the EU member state in question. Methods should be both affordable and an efficient way to quantify CRtotal. The provisional political agreement on the Regulation requires that “The monitoring shall be based on an appropriate combination of on-site measurements with remote sensing or modelling according to the rules set out in the appropriate certification methodologies.” Therefore, monitoring could not be based exclusively on remote sensing or modelling, and some form of on-site measurement is required.

General issues to be addressed/solved:

• The use of default values as provided by IPCC for LULUCF or the use of project specific or activity specific default values.
• One needs a calculation method that is, on one hand, based upon monitoring data (direct measurements), but on the other hand also applicable in situations where direct measurements of CRtotal are not possible. This is also important because ‘operators’ and ‘certifiers’ must be able to conduct certification in an affordable manner.</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">

Carbon is lost as dissolved organic carbon (DOC) and particulate organic carbon (POC), but this is difficult to measure.
How can indirect measurements (water tables, vegetation mapping, sediment cores) be used to assess CRtotal.
CRtotal can be a result of a combination of land use change and/or management change. How can land use change be addressed in certification schemes by making use of advanced technologies available under Union programmes, such as Copernicus?
The usage of different tiers of quantification methods should be consistent with LULUCF.

In reviewed certification methodologies (Annex B) and LULUCF, quantification of carbon removals in peatlands is done with direct measurements, indirect measurements, remote sensing and model approaches, or a combination of those approaches. Each approach has its cons and pro’s (see below).

Key Questions:

- Which of the three options (A, B, C) is preferable to quantify carbon removals (CR_{total})?
- Which is the best guidance to build on for measurements of direct and indirect emissions of activities?
- Should there be a pre-approved list of models that can be used or is a general guidance on model application sufficient?

</td></tr>
<tr><td>Objective</td><td colspan="2">

Clear rules on how a robust assessment can be made of the carbon removal, of all carbon pools (formula), from a carbon removal activity.

Alignment in the quantification approaches that are used in certification methodologies in the different EU member states.

</td></tr>
<tr><td>What is there already?
Existing proven certification methodologies</td><td colspan="2">

The reviewed certification methods (Annex B) provide data and information about net changes in emissions of greenhouse gases based on a combined strategy of modelling and monitoring of GHG fluxes (direct and indirect measurements). Although DOC and POC are part of the UK Peatland Code methodology, it is not included in the LULUCF.

Direct measurements of CRtotal:

- Greenhouse gas fluxes towards atmosphere (chamber measurements and eddy-covariance measurements)

Indirect measurements of CRtotal:

- Soil subsidence
- Changes in water table
- Changes in vegetation (GEST)

</td></tr>
<tr><td>What are the options?</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Option A: Aligned assessment of CRtotal, using EU-Copernicus data as a basis.</td><td>

- The knowledge base (soil, vegetation) is the same for EU member states.

</td><td>

- Spatial resolution might be too low to monitor any change in CR_{total} on parcel level.

</td></tr>
</table>

	• Land use change can be identified with remote sensing data as collected by EU Copernicus data.	• Methods to assess relevant changes in activities/ management are still in development.
Option B: Monitoring (modelling) based on direct measurements	• Accurate, lower scientific uncertainties;	• Expensive (financial investment, labour). • Not preferred to have long-term equipment on agricultural land (unpractical). • academic and technical expertise is needed at operational level.
Option C: Monitoring (modelling) based on indirect measurements	• Financial Affordable. • Less measuring equipment on site.	• Higher scientific uncertainty in assessing CRtotal compared with direct measurements. • In terms of labour also indirect measurements have prohibitive costs.
Summary of focus group feedback	*Summary of discussion* Consensus: All three methods are essential, as direct measurements are required to know the exact fluxes CRtotal, modelling to supplement them and proxies need to be monitored through remote sensing. The measurement intensity and method can vary through time. More intensive direct measurements of fluxes at the beginning of the activity period and later extrapolating using remote sensing, modelling, and indirect approaches for cost-efficiency. In carbon-rich soils, changes in soil organic carbon (SOC) cannot easily be measured, due to the slow speed of change and large uncertainties in quantifying peat carbon stocks. A more efficient way to directly measure CRtotal would be to measure the fluxes exchanged with the atmosphere. These fluxes can be reliably measured by eddy-covariance of chamber measurements. However, it is unclear who will finance these measurements. Indirect measurements could use the correlation of vegetation composition and water table dynamics as indicator for carbon dynamics (i.e., as indirect measurement). This approach is applied by the UK Peatlands Emissions Inventory, and several initiatives are ongoing to collate data on fluxes, water table dynamics and vegetation proxies (e.g., ICOS, WetHorizons, MOTHERSHIP). Using vegetation data as indicator for CRtotal is deemed to have lower uncertainties than measuring (changes in) soil subsidence as indicator for reduced emissions. Direct monitoring systems would need to be continually updated to keep track of fluxes in the future. Constant monitoring is required to recalibrate proxies. Remote sensing methods to map ecology are still in early development stages. Accurate mapping of relevant properties at scale for the purposes of quantifying carbon emissions is still evolving.	

	A pre-approved list of models can limit integration of developments in the science behind quantification of CRtotal. It would be better to provide general guidance on which model might be suitable, under the condition that they have a scientific basis. *Points to take into account:* • The quantification of reductions and removals need to be strictly separate as they are fundamentally different. Mixing of concepts is dangerous, for example: avoidance or reduction of carbon emissions is not equal to carbon removal. • In each theme of the CRCF proposal (agriculture, forestry, peatland) the certification method should be aligned. This means, for example, that all methods should include all greenhouse gases (CO_2, N_2O and CH_4).
Open questions	• Which models of peatland C-uptake and emissions are suitable as basis for quantification of CRtotal? • Remote Sensing products, used under option A, are not only developed by the EU (Copernicus), but also by private parties. These often offer their services to certifiers. How can quality be guaranteed and how can these types of private products be used to quantify emissions and to formulate a standard or activity specific baseline?
Next steps	Identify the right level of prescriptiveness of the methodology and develop the MRV rules

3.3 Quantification of the direct and indirect emissions

Implementation of new peatland management strategies or land use change (for example from grassland to paludiculture) that aim to reduce GHG emissions from the peat soil might involve also an increase of direct GHG emissions, e.g. from increased fuel use, fertilizer use, or pesticide use or indirect GHG emissions, such as from land use change or leakage of emissions to other locations. As these emissions reduce the effectiveness of the carbon farming practice, the increase of emissions must be subtracted from the quantified carbon removals / emission reduction. The direct emission sources that are involved depend on the type of carbon farming practice, but in general quantification is straightforward based on IPCC guidance or making use of emission factors from national GHG inventories. For indirect emissions it is less clear as these can often not be quantified directly.

Definition	*Related to Annex I (e) rules for calculating GHG associated emissions referred to in Article 4(1), point (c), in Article 4(2.1), point (c), in Article 4(2.2), point (g), and in Article 4(2a), point (c)*(c) **$GHG_{associated}$** is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation, including indirect land use change
Problem	It is important to measure the increase in direct and indirect GHG emissions to ensure reliable carbon removals in a relevant, accurate, complete, consistent, and comparable manner. **Key Question:**

<table>
<tr><td></td><td colspan="2">How should the methodology for peatland land use ensure that direct and indirect emission from land use change is considered?

General issues to be addressed/solved:
This question includes leakage, for instance when the activity moves elsewhere due to rewetting and leads to impacts.
Clear system boundaries need to be set of which sources of emissions to consider.</td></tr>
<tr><td>Objective</td><td colspan="2">Clear rules on how a robust assessment can be made of direct and indirect GHG emissions resulting from the carbon removal activity.</td></tr>
<tr><td>What is there already? Existing proven certification methodologies</td><td colspan="2">MoorFutures: Indirect GHG emissions are not calculated and assumed negligible.
Climate4Future: covers indirect emissions associated with the secondary use of biomass (e.g., the agriculture and livestock use of mowed vegetation) and fuel usage. If significant GHG emissions occur, they are quantified (tCO_2e/yr.) for the duration of the project.
UK Peatland Code: operators must determine if direct and indirect emissions occur, and if so subtract them from the projected emissions reductions claimed.
Currency for Peat: emissions caused by the actions of the landowner are included.
ECS KlimaMoor: emissions of renaturation process (helicopters, transportation, etc) are calculated through gasoline usage and then subtracted from climate project effects.
Wetlands4Climate includes the calculation of the carbon balances associated to the secondary use of biomass (e.g., the agriculture and livestock use of mowed vegetation); the carbon emissions associated to the fuel consumed by the machinery during management actions and the entire life cycle of the materials used/resulted in the implementation of management actions, as well as greenhouse gas emissions caused or removed by them.</td></tr>
<tr><td>What are the options?</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Quantification of all possible indirect emissions</td><td>Should give a more realistic estimate of the real carbon removal / emission reduction.
In line with the amendments of the European Parliament
Some guidance is available from existing methodologies</td><td>Difficult to really quantify these impacts at project scale.
Many assumptions required and probably not very transparent</td></tr>
<tr><td>Excluding indirect emissions that are difficult to quantify (large uncertainties)</td><td>Simpler approach</td><td>Risk of over-estimation of carbon removal</td></tr>
</table>

Summary of focus group feedback	*Summary of feedback relevant for this issue* <u>Consensus:</u> Experience from existing methodologies should be consulted to tackle direct and indirect emissions, wherein (livestock) leakage and clear system boundaries should be considered, include e.g., life cycle assessments. Direct and indirect emissions from activities are included in the registration in other contexts. These data could be requested from those databases. *Points to consider:* • Indirect emissions from NOx are difficult to assess.
Open questions	-
Next steps	Define a method to quantify associated emissions based on existing methodologies and existing emission registration databases.

3.4 Rules for baselines

3.4.1 Introduction

The first step in the Quantification process is that operators should quantify the amount of additional carbon removals or soil emission reductions that an activity has generated in comparison to a baseline. In the case of carbon farming, the quantified carbon removals or soil emission reductions should ensure that any carbon release occurring in a carbon pool is considered in an appropriate way in computing the net benefit of the activity. A standardised baseline should be representative of the standard performance of comparable practices and processes in similar social, economic, environmental, and technological circumstances and consider the geographical context, including local pedo-climatic and regulatory conditions. Such approach to establishing the baseline should be preferred because it ensures objectivity, minimises compliance and other administrative costs, and positively recognises the action of first movers who have already engaged in eligible activities. In the context of carbon farming, only practices and processes that go beyond the common practice should be certified; therefore, a specific carbon farming activity should not be rewarded if it is already widely adopted within a region with similar pedo-climatic and regulatory conditions. The standardised baseline should ensure that, once an activity becomes the common practice, such activity cannot be certified any longer. To this end, the Commission should review at least every five years and update, as appropriate, the standardised baselines in light of evolving regulatory circumstances and of the latest available scientific evidence to reflect the social, economic, environmental, regulatory, and technological developments and to encourage increased ambition over time in line with the Paris Agreement.

In addition, the use of available digital technologies, including electronic databases and geographic information systems, remote sensing, novel on-site carbon quantification systems, artificial intelligence, and machine learning, and of electronic maps, should be promoted to decrease the costs of establishing baselines and ensure the robustness of the monitoring of the activities. However, where it is not possible to set such a standardised baseline, an activity-specific baseline based on the operator's individual performance should be used. The activity-specific baselines should be updated by the operator at the beginning of each activity period, unless otherwise stated in the applicable certification methodologies. The reviewed certification methodologies for peatlands apply a project-specific baseline. *KLIMAMOOR* and to a lesser extent *UK Peatland code* also use national standardized data.

3.4.2 Standardised baseline

This section has been developed by JRC. The standard baseline applies to soil and the evaluation in this section applies to Agriculture, Forestry and Peatlands.

Definition	Rules for calculating the carbon removals under the baseline referred to in Article 4(1). Permanent net carbon removal benefit = $CR_{baseline} – CR_{total} – GHG_{associated} > 0$ **$CR_{baseline}$ is the carbon removals under the baseline.** (5) The baseline shall be highly representative of the standard performance of comparable practices and processes in similar social, economic, environmental, technological, and regulatory circumstances and take into account the geographical context including local pedo-climatic and regulatory conditions ('standardised baselines'). (6) By way of derogation from paragraph 5, where duly justified in the applicable certification methodology, including due to the lack of data or the absence of sufficient comparable activities, an operator shall use a baseline that corresponds to the individual, performance of a specific activity ('activity-specific baseline').
Problem	The estimation of land C fluxes (emissions/removals) is a highly challenging process that may lead to different results depending on data and methodologies applied (McGrath et al., 2023). So far, there is not a consolidated method, but a combined approach may provide the best estimate overcoming each methodology limitation. One of the main problems is that complex scientific tools and substantial amounts of data are used in the scientific community to derive large scale territorial land fluxes, which can be difficult to operationalize in a simple equation. **Key questions**: **Similar social, economic, environmental and technological circumstances** • Which data and variables can be used to describe the 'social' and 'economic' dimensions (e.g., farmer income, farm size, wood prices, etc.)? Alternatively, should the 'social,' and 'economic' dimensions be defined in a geographic way, for instance considering administrative regions (e.g., NUTS 1-2-3) as strata? In case administrative units are chosen, which NUTS level

	is more appropriate? • What fundamental 'environmental' strata are envisaged to develop a standardised baseline (e.g., specific soils properties, climate, vegetation properties – crop type, tree species, stand age, etc.)? • Should a pan-EU dataset (e/g LUCAS, Copernicus data, ESA CCI biomass maps etc.) be preferred as environmental strata to guarantee a high level of standardisation or should national (sub-regional data) be prioritized? What would be considered good datasets for a specific sector of interest? **Carbon removal performance / Greenhouse gas increase** • The carbon removal performance is expressed as GHG fluxes. What impact does this have on early movers that have already achieved high C stocks and have consequently low removal rates? Is it recommendable and/or fundamental to reward them? • What data are needed to establish the baseline for calculating the GHG fluxes (i.e., not only CO_2 but also N_2O and CH_4) due to the implementation of the carbon farming activity? Would a standardised baseline be possible for these fluxes? Could they be approximated by lower tier IPCC-based calculations? **What does "standardised" mean?** • In your view, should the standardised baseline be dynamic (i.e., represent a trend over the period in question) or static? • How long should the reference period need to be to calculate the standardised baseline? Should it differ by sector such as agriculture/forestry/peatland), and if so, how? • Could data from the National Greenhouse Gas Inventories be used? If based on higher tiers and spatial explicit approaches, would these be able to provide regional emissions/removals? • An activity- specific approach can be used in the absence of data to develop robust standardised baselines. Based on your knowledge on the currently available data and methodological approaches, in which sectors (forest, peatland and agriculture) could the standardised baseline be applicable from the start?
Objective	Set a robust methodology to calculate net ecosystem carbon emission/removals (from soil and vegetation) that reflects the current status of homogenous areas for type of land cover/use and pedo-climatic conditions.
What is there already? Existing proven certification methodologies	The baseline is often defined as fixed (measuring the removal/emissions rates at the start the project) or dynamic (updating the values over time). Different methodologies ranging from sampling to modelling and hybrid approaches are used depending on the certification scheme, including project specific and (to a lesser extent) standardised (Oldfield et al., 2021; McDonald et al., 2021; Batjes et al., 2023). For temperate and boreal forest guidelines are also available[2].

[2] https://verra.org/wp-content/uploads/imported/methodologies/VM0012-Improved-Forest-Management-Projects-in-Temperate-and-Boreal-Forests-LtPF-v1.2.pdf

	Some mechanisms allow for a standardised baseline calculated over a geographic region, which can be set at the national of jurisdictional level. It is more used in the forestry sector (e.g. NZ Permanent Forest Sink Initiative, Woodland Carbon Code, California's Compliance Offset Programme)	
What are the options?	Pros	Cons
Use of Pan-EU elaborated dataset (e.g., soil maps, Copernicus data, land cover, ESA CCI biomass maps etc.)	• Provide a standard. • Freely available for MS. • Less systematic biased among MS. • Strata for clustering.	• Possibly less accurate than national local datasets. • Time dependence of the product Underlying raw data not easily available or manageable for further elaboration.
Use of soil inventories: (at national or local scale, e.g., National inventory data, but also LUCAS soil sampling point data)	• Direct measure of a state variable. • Better local knowledge. • Data already available or required for Soil monitoring law (if adopted). • New data collected by the operators during the certification period.	• Mainly limited to SOC content. • Lag between sampling and data usability (less useful for dynamic baselines). • Sampling density and representativeness. • Elevated cost. • Variability and standardisation.
Remote sensing-based datasets of state variables (e.g., aboveground stocks) and management activities	• Good spatial representation and distribution. • Timely estimate (including effects of recent climate change effect on vegetation states. Ideal for dynamic baselines). • Cost-effectiveness.	• Mostly limited to aboveground biomass and few key parameters. • Rely on the use of modelling to calculate the net C removals from the monitored state variables (e.g., allometric equations). • Representative only of the last years (limiting for baselines calculated over long past periods). • The products require ground datasets for validation.
Process-based modelling	• Cost-effective. • Easily updatable. • All C fluxes and stocks. • 'Projected' and 'dynamic' baseline development.	• Requiring high skills. • Calibration and validation. • Computational time for regional simulations. • Data demanding. • High uncertainty even when calibrated;
Summary of focus group feedback	General consensus (see also Technical Assessment paper Agriculture): Farm sizes in carbon farming projects or countries should determine the scale for the standard baseline. Many participants were in doubt whether the NUTS scale is the right scale to identify a standard baseline. *Other points* • Not all participants agreed that a standardized baseline should be the default. Much of the national data is not yet in order, such as the drainage and hydrological conditions of peat. Preparation time must be considered to get the	

	data in accurate shape to develop a standard baseline. Until then an activity specific baseline should be used. • The group is in favour of using a hybrid approach (national, regional, and local (project specific) data) to be incorporated in the standardised baseline. A statistical method is proposed, where it can be defined how well an EU-dataset represents a local situation. Based on the outcome it can be decided to incorporate more localised data.
Open questions	-
Next steps	Development of the concept and collection of data

3.4.3 Activity-specific baseline

This section discusses activity-specific baselines and project-specific baselines, which can be applied until standardised baselines are ready for implementation. A project-specific baseline is defined based on the specific conditions and emissions at the location where the project will take place. An activity-specific baseline, however, is defined based on average conditions and emissions belonging to a specific land use and management (i.e., activity). These conditions may be averaged on geographic levels, such as nationally or regionally.

Definition	Rules for calculating the carbon removals or soil emission reductions under the baseline referred to in Article 4(2): Net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated} > 0$ Net soil emission reduction benefit = $LSE_{baseline} - LSE_{total} + ASE_{baseline} - ASE_{total} - GHG_{associated} > 0$ $CR_{baseline}$ is the carbon removals under the baseline. $LSE_{baseline}$ are the LULUCF soil emissions under the baseline. $ASE_{baseline}$ are the agricultural soil emissions under the baseline. Article 4(6): By way of derogation from paragraph 5, where duly justified in the applicable certification methodology, including due to the lack of data or the absence of sufficient comparable activities, an operator shall use a baseline that corresponds to the individual, performance of a specific activity (‘activity-specific baseline’). *Related to Annex I (c) rules for calculating the baseline referred to in Article 4(1), point (a), or in Article 4 (2.1), point (a) and (2.2), points (a) and (c), or in Article 4(2a) point (a)*
Problem	The existing certification systems for peatlands often use an activity-specific baseline. In the CRCF proposal there is a preference for using a standard baseline. There is therefore a gap to be bridged between policy objectives and practice.

Objective	The quantification of carbon removals/emission reductions should be based on a robust approach and provide reliable outcomes. As currently no standardised baseline is available, most projects are likely to use a project or activity specific baseline in the first years after the start of the CRCF. Clear rules for activity specific baseline have to be defined. *The following aspects have to be addressed:* • The type of baseline being used will depend on the quantification approach. • Defining the duration of the pre-project period on which the baseline will be based. • Frequency of updating the baseline (this is also related to the definition of the activity period, see Chapter 5). • Monitoring systems would need to be continually updated to keep track of fluxes in the future. The same baselines cannot be used after 10-20 years.
What is there already? Existing proven certification methodologies	*Moorfutures* - The GHG emissions that occur over the lifetime of the project, are calculated ex-ante, based on the expected changes in water level (rewetting strategies). The vegetation cover at the specific site is used as a proxy for the baseline emissions (GEST method). The baseline is described with support of detailed (project specific) vegetation mapping of the project area. During the rewetting process, monitoring of the vegetation is used to estimate changes in emissions by using the GEST method. Calculations are reviewed after 3-5 years after implementation of the measures and then every 10 years. Monitoring and verification are performed by a designated publicly funded regional scientific research institute (universities of Greifswald, Kiel, Eberswalde and Osnabrück), representing the four federal states in the scheme. *LIFE OrgBalt* - Soil CO_2 balance is estimated in projects by chamber-based measurement techniques. The annual soil CO_2 balance is assessed by using CO_2 flux data and data on the mass-based C-stock changes. *UK Peatland Code* - Projects establish beforehand a GHG emissions baseline (tCO2e), additional GHG emissions reductions are calculated, using the Peatland Code Emissions Calculator. GHG emissions used in the calculation of emissions factors include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), dissolved organic carbon (DOC) and particulate organic carbon (POC). Emission factors are defined for combinations of peatland type, land use and ecological condition, and are dependent on peat depth and water table (in the case of fens). The Peatland Code validates ex-ante emissions reductions (but verifies ex-post emission reductions) and therefore only restoration actions that result in an immediate condition category change are eligible. *KLIMAMOOR* - These certification method uses national data as reported to LULUCF, specifically the following: - Net carbon stock change in above- and below-ground biomass - Net carbon stock change in litter

<table>
<tr>
<td></td>
<td colspan="2">- Net carbon stock change in soil organic carbon (organic)
In KLIMAMOOR only the top 50 cm of peat are part of the baseline taking into consideration that this part of the peat is at risk in the next 50 years. Measures to reduce GHG-emissions have the most impact in this part of the soil.

Currency for Peat - The actual height of the groundwater level in the initial situation is determined by monitoring beforehand or on a reference plot. An average groundwater level in peatland that is representative for a specific region can also be chosen as a baseline. The baseline is project-specific and differs per region in the Netherlands and (future) land use. For example, if rewetting is combined with a land use change from conventional agriculture towards agricultural nature management, then the (hydrological) baseline is described by the preconditions of the associated “nature target type.” “Nature target types” are part of a subsidy regulation for nature conservation (Index Natuur, previously known as SNL Subsidy). The CO_2 emissions in the baseline situation are assessed in an analogous way as in Moorfutures by combining vegetation cover mapping and groundwater tables (GEST method) based on the same scientific basis (Jurasinski, Günther, Huth, & Couwenberg, 2016; Fritz, et al., 2017). Baselines are evaluated after 10 years to see if it needs to be adjusted on the basis of changed circumstances or insights.

Currency for Peat uses three levels of verification of the project specific baseline for operators:
- Reasonable assurance: aerial photos are requested and analysed to check the project. The monitoring of the baseline can be repeated by the verifying institution. This option is the most expensive (> €10,000).
- Limited assurance: verification of CO_2 reduction with a limited degree of assurance (i.e., it has not been found that there is anything wrong). This form of verification is common for Corporate Social Responsibility and sustainability reports; costs are estimated between €5,000 and €10,000.
- Report of specific testing (e.g., no conclusion by the inspection body, but SNK itself determines whether the results of this testing of the monitoring report provide sufficient certainty for the issue of certificates). This option is the least detailed and therefore the cheapest (up to €5000).</td>
</tr>
<tr>
<td>What are the options?</td>
<td>Pros</td>
<td>Cons</td>
</tr>
<tr>
<td>Option A:
Develop an activity-specific baseline on <u>national</u> level (e.g., KLIMAMOOR approach)

Note: there are also arguments to define this option as a standard baseline. However, we want to clarify the cons and pros</td>
<td>• When national data is used, the baseline becomes easier to compare with other certification methods that are based on the standard baseline.
• Cost-effective: the data is already collected and analysed for national and international policy objectives.</td>
<td>• Depending on the country at stake, the national data may have low spatial resolution. That is certainly the case for the temporal resolution. The spatial diversity and temporal dynamics in soil, hydrology and vegetation are so great that changes due to the measures taken to reduce GHG emissions cannot be properly estimated.</td>
</tr>
</table>

between a country-specific baseline compared to a baseline that is based on data collected on EU level.	• Monitoring data is available before a project starts. In other words: the availability of data is less constricting to calculate the baseline for the pre-project reference period.	
Option B: Develop an activity-specific baseline on <u>regional level</u> (Examples: Province Groningen, Normandie) (e.g., Currency for Peat, UK Peatland Code)	• De project specific baseline is more representative for the local conditions compared to option A. • At national level it becomes easier to compare the results of the projects (in terms of GHG reduction or carbon removal) compared to option C. • In this way, the results of the different projects can be added up more easily and the joint contribution of all projects can be assessed, for example to evaluate national climate policies.	• Data availability is more often a constraint for the pre-project reference period compared to option A. • If there are different certification methods based on regional data in each country, then evaluating European climate polices becomes more complex. • It will take more effort to verify the scientific accuracy of the rapid assessment models (calculators) used compared to option A and who is responsible for this verification?
Option C: Develop a project-specific baseline on local project level (Example: A project in which 50 Ha peatland is rewetted).	• The highest accuracy is achieved for the operator. • The bandwidth in uncertainty and the risks of lower income from certification are in option C the lowest for the operator. The institution that issues the credits also has fewer risks. • At project level it is also easier to determine co-benefits for other policy areas.	• High Costs. • Labour intensive. • How are the costs divided between operator, government and the institution that issues the credits? • It will take more effort to verify the scientific accuracy because you have to this for each individual project.
Summary of focus group feedback	*Summary of discussion* <u>Consensus:</u> No consensus was reached on the best option for activity/project-specific baselines. However, the discussion highlighted the importance of a balance between managing uncertainties, financial risks and providing incentives to participate. Not all participants agreed that a standardized baseline should be the default. Much of the national data is not yet in order, such as the drainage and hydrological conditions of peat. Preparation time must be considered to get the data in accurate shape to develop a standard baseline. Until then an activity specific baseline should be used.	

	Other points to take into account: • Direct measurements of NEE/Fluxes/Carbon removal in peatlands are not only necessary to develop a baseline, but also to validate proxies (water tables, vegetation, etc.). These measurements should be made in the pre-project reference period executed by an independent organization (not by the operator himself) for several reasons (a) expensive, (b) operators may lack the competences to apply complex scientific measurements and (c) independent. • There are several initiatives already ongoing to collate data and examine the emission factors, rewetting impacts, temporal dynamics, and test water table and indirect vegetation proxies, e.g., ICOS, WetHorizons, MOTHERSHIP. These could be the basis of a baseline applied to peatlands.
Additional questions discussed in focus group	<u>How long should the pre-project reference period for setting the project specific baseline?</u> This question was only briefly discussed. The peatland group did not identify a preferred length of the pre-project reference period. There was consensus that the pre-project phase should be as short as possible. Considerations for a short pre-project reference period: • Long-term monitoring to identify an activity specific baseline is not preferred because of pre-investment costs in time and finances. • In UK Peat Code the baseline for activity specific baselines uses the situation maximum of 3 years before the carbon removal/reduction measure as reference. In fens, a minimum of 12 months of water table data is required. Arguments in favour for a longer pre-project reference period: • If a longer pre-project reference period is chosen, there is more insight into the temporal variation of emissions in the baseline situation. <u>What should be criteria for the using the project specific baseline instead of the standardised baseline?</u> A suggestion was made to give the operator the option to choose whether to use the standard or the activity specific baseline. That is possible when the operator has the possibility to prove that an activity specific baseline is more suitable. However, other participants considered this freedom as not desirable. Some participants are in favour of incorporating updates of the activity/project-specific baselines over time. This would enable improvements in baselines and Carbon Removal/Emission Reduction measurements over time to reduce uncertainties and update data. While other members of the expert group (e.g., UK Peatland Code) do not include updates in baselines, to reduce uncertainty for the operator.
Open questions	What form will the baseline have? Is it (1) a fixed reference point in time, (2) a dynamic reference considering developments in the field, or (3) a 'forward

	looking' baseline (which uses hypothetical future situations as reference). A choice should be made between these options before more concrete criteria can be addressed.
Next steps	More discussion on the above topics is needed to find the right method of formulating activity-specific baselines.

3.5 Quantification of statistical uncertainty

Uncertainties in the quantification should be duly reported and accounted to limit the risk of overestimating the quantity of carbon dioxide removed from the atmosphere. Carbon removals generated by carbon farming in peatlands should be quantified with an elevated level of accuracy to assure the highest quality and minimise uncertainties.

The quantification of carbon removal in peatlands involves inherent uncertainties due to numerous factors and complexities associated with these ecosystems. Some of these uncertainties are briefly explained in the following paragraph.

Peatlands can be highly heterogeneous in terms of vegetation, soil properties, and hydrological conditions. The variability in these factors can make it challenging to obtain representative measurements and extrapolate them to larger areas. To continue, the carbon stored in peatlands is often concentrated in deep peat layers. Accurately measuring the depth of peat and estimating carbon content at different depths can introduce uncertainties. Furthermore, changes in water table levels, drainage, or rewetting can significantly influence carbon dynamics in peatlands. The hydrological conditions of peatlands are subject to natural variability and can be impacted by human activities, introducing uncertainties in carbon accounting. There can be uncertainties related to climate change as peatland ecosystems are sensitive to climate change, which can affect vegetation, decomposition rates, and overall carbon balance. Predicting future climate conditions and their impact on peatland carbon dynamics introduces uncertainties.

To continue, peatlands can be a source of methane (which has been discussed previously). The quantification of methane emissions and their variability over time is subject to uncertainties, and different management practices can influence these emissions. We also have the uncertainties towards monitoring techniques. The methods used to measure and monitor carbon in peatlands, such as remote sensing, field surveys, and laboratory analyses, come with their own uncertainties.

Uncertainties play a role in the risk management of a certification system. Risk can be defined in the following ways:

- Financial Risk = Probability of a (partially) unjustified payment of a carbon credit * Financial Impact (in euros)

Financial risks can be in place for the (private) operator and the public/private financial institutions that are responsible for the payment.

- Climate removal Risk = Probability of higher/lower climate removal than predicted with scientific instruments * Climate Removal Impact (in ton kton CO_2-eq).

Both types of risks are closely related. The CRCF proposal emphasizes the statistical accuracy of the estimated/calculated carbon removal of the certification method. We will therefore only discuss the climate removal risk in the table.

Definition	*Related to Annex I (f) rules to address uncertainties in a conservative manner in the quantification of carbon removals referred to in Article 4(8):* The quantification of permanent carbon removals, temporary carbon removals from carbon farming and carbon storage in products, and soil emission reductions shall account for uncertainties in a conservative manner and in accordance with recognised statistical approaches. Uncertainties in the quantification of carbon removals and soil emission reductions shall be duly reported.
Problem	The quantification of Soil Organic Carbon (SOC) removals/emission reduction should be based on a robust approach and provide reliable outcomes. Ideally the quantification should therefore be accompanied by an uncertainty estimate to provide confidence in the measured or calculated carbon removals/soil emission reductions. Quantification of uncertainty depends on the quantification approach. With soil measurements, the uncertainty is based on the soil samples and laboratory analysis, while for model-based approach uncertainty of the input data, model parameters and model structure are relevant. The reviewed certification schemes for wetlands (Annex B) use also hydrological proxies. When indirect hydrological indicators are used to estimate changes in carbon removal, the uncertainties are inherently greater than with direct measurements. Therefore, there is a need to align uncertainty estimates in the different methods that use hydrological proxies. **Key Question for Focus Group:** Statistical uncertainties and associated risks concern the spatial scale for which carbon removal is assessed in the certification method. • Should statistical uncertainty be quantified, or should the methodology only have a mechanism to deal with spatial uncertainties? • What guidance is needed to align choices in spatial scale?
Objective	Clear rules on how a robust assessment can be made of the uncertainties resulting from the quantification of the carbon removal activity.
What is there already? Existing proven certification methodologies	*Existing certification method examples:* **MoorFutures:** • Buffer of 30% of possible GHG reduction is applied to avoid any uncertainties and unforeseen changes in the project implementation. • use a conservative calculation of the baseline (underestimated) and project scenario (overestimated) • In the baseline scenario, continuing subsidence could cause complete peat oxidation in some parts of the project area before the end of the project crediting period. For these sub-areas, credits are issued only for the time during which the peat would be present in the baseline. • Calculations are reviewed after 3-5 years after the measure and then every 10 years. In case of deviations, the project scenario must be adjusted, and the emissions recalculated.

<table>
<tr><td></td><td colspan="2">UK Peatland Code: The project shall contribute 15% of net GHG emissions reductions over the project duration to the Peatland Code Risk Buffer.

LIFE OrgBalt: Uncertainties assessment is based on the uncertainty of activity data and applied models. Uncertainties of the business as usual and with measure scenarios are combined using the approach applied in the National GHG inventory.

Currency for Peat (SNK): for peatland rewetting, there are a number of risk factors that may prevent the intended emission reduction during the project from being achieved. These can be general or project specific. When certificates are issued at the start of the project, the number of risk factors is greater (then when certificates are issued after the project). Partly for this reason, a reserve buffer is used.

Wetlands4Climate: The actual rates of water-air exchange of GHGs (CO2 and CH4) are determined both ex-situ from intact sediment cores and in situ using closed chamber method which provided complementary results to better understand mechanisms of carbon flux between wetland and atmosphere. Different closed chamber configurations (i.e., height and surface area) are used to also integrate emergent vegetation in these measurements.</td></tr>
<tr><td>What are the options?</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Explicit quantification of statistical uncertainty</td><td>• Provides more insight in the certainty of the quantified carbon removals.
Uncertainty quantification is also required for reporting following GHG protocol.</td><td>• Difficult to calculate as required data (e.g., probably distributions) are often not available.
• Additional administrative burden.
• Requires highly skilled intermediaries.
• Uncertainties in soil carbon sequestration are high and might lead to large deductions, especially if applied at small scale (farm level or small projects).
• Takes long term measurements to fully catch temporal variability.</td></tr>
<tr><td>Generic approach for dealing with statistical uncertainty (e.g., program-wide risk sharing)</td><td>• Much simpler approach and therefore lower costs.
• More transparent
• Uncertainty can be spread among multiple projects within a programme;</td><td>• Higher risk of under- or overestimating carbon removals.
• Uncertainties are biased towards regions where data for generic approach stems from. This may lead to misrepresenting uncertainty in other locations.
• Not sufficient to comply with GHG protocol criteria.</td></tr>
</table>

Summary of focus group feedback	*Summary of discussion* <ins>Consensus:</ins> Uncertainties should be calculated on activity-based project level (preferably long-term) to avoid bias, wherein the level of accepted uncertainty on a programme level need to be determined: being overcautious in terms of uncertainties leads to no action, but too underestimating uncertainties may lead to overselling and reputational risk for the certificates created. It is preferred to deal with uncertainties on a programme level, because then risks due to uncertainties are shared among many projects and levelled out. Quantifying uncertainties on project level would need large efforts. *Points to take into account:* • When uncertainties are extrapolated across programmes, care should be taken to use data that is representative of all locations covered by the programme, to avoid bias towards more intensely studied regions. • The possibility should be explored to be more generous to operators taking risks in their projects (also considering co-benefits), while being conservative when selling credits in compensation schemes. This also removes concerns about ‘green washing’ by being conservative towards offsetting. Being too conservative towards operators’ risks reducing the incentive to participate. • The level of uncertainty relates to the method used to quantify CR_{total}. In general, proxies (indirect measurements) are tricky, and many things need to be considered. The use of water table measurements as a proxy is less uncertain than the vegetation composition approach, whereby ongoing developments in quantification methods can lower the uncertainty further. • High quantification uncertainties cause concern when the certificates are used for offsetting emissions. Measurement data from longer timescales can even out uncertainties. Therefore, a long-term approach is required for peatlands with repeated measurements and short-term changes in conditions should not be rewarded. • In contrast, payments that are activity-based and not results-based will reduce the risks for the operator related with uncertainties of emission reductions. • Existing literature, such as IPCC reports, should be consulted to understand how to deal with statistical uncertainties, although such approaches would be problematic to apply on a project level. • There is the possibility to set a minimum requirement in terms of uncertainty. Where the quantification method and data (e.g., flux tower data, ecological mapping, or water level measurements) need to meet a minimum certainty before it can be used in the quantification of CR_{total} or in the formulation of baselines.
Open questions	How to deal with uncertainties about duration of projects. In the case when at the end of a project the rewetting is reversed and emissions increase again, would this undo previous reductions of emissions or does the framework view any (temporary) reduction of emissions a win?

Next steps	Define how programme specific accepted levels of uncertainty can be obtained

3.6 Feedback Expert Group on Quantification topics

Experts mentioned that a combination of measurements (organic carbon content, peat depth and groundwater level) and models could be feasible. It is mentioned that direct measurement might be too expensive for operators. As for proxies and indicators, some mention that vegetation should only be a supplement and not the main proxy. Some suggest member states should initiate research to make reliable models on national scale. It is mentioned by some experts that system boundaries should be broad, and CH_4 and N_2O should be included. Emissions quantification should be based on IPCC guidelines.

For standardised baselines, it is mentioned that national NIR data can only be used if they give a good approximation e.g. member states with tier 3 methodologies. Some experts support an approach with different types of data (national, regional, local and activity-specific data). For activity specific baseline there are varying views. While an expert suggests 3–5-year pre-project baselines, others suggest that landowners might not participate in projects if they must wait 2 years or longer to monitor and get data on the pre-project situation. As for statistical uncertainty, one expert advocates for explicit quantification to have accuracy and reliability, while others are in favour of a more generic approach combined with sharing risk among many projects.

4. Additionality

4.1 Introduction

Background

The rationale of the CRCF proposal is that operators will adopt new and additional, improved cultivation practices to achieve verifiable emission reductions or removal of greenhouse gases. The certification therefore applies to additional efforts by the operator and is not intended for activities that would have taken place in a business-as-usual scenario, for example because a certain activity is already happening, financed by a third party, or required by law or national policy.

To ensure that the Union certification framework channels incentives toward carbon removals that go beyond the standard practice, carbon removal activities should be additional and must represent a real and additional reduction or removal of emissions compared to what would have happened in the baseline scenario.

Additionality rules must also consider whether the operator is already rewarded for the same activity through other financial arrangements from the EU or national governments or whether additional rewarding via carbon credits is needed to make the activity financially viable. In other words, carbon removal activities should take place due to the incentive effect provided by the certification, which make it possible to cover the costs of implementation.

In case of an activity that performs better than the standardised baseline, the additionality criteria are complied with. Therefore, the additionality criteria regarding regulatory and financial additionality are only relevant in case the activity-specific baseline is used.

To assess the additionality of an activity, it is necessary to set rules on how to test this (Article 5(2). In section 4.2 we consider the following options (1) Regulatory additionality (i.e., carbon farming practice should go beyond current obligatory practices), (2) Financial additionality (i.e., carbon farming practice should be implemented as results of the financial incentive from the carbon certificates).

4.2 Additionality rules in case of an activity-specific baseline

Definition	Article 5 - Additionality (1) Any activity shall be additional. To that end, it shall meet both of the following criteria: (a) it goes beyond Union and national statutory requirements at the level of an individual operator. (b) the incentive effect of the certification is needed for the activity to become financially viable. *Interpretation: some existing certification methods qualify the first criterion as regulatory additionality and the second one as financial additionality.* (2) Where the standardised baseline established pursuant to Article 4(5) or (5a) is used, additionality as referred to in paragraph 1 is complied with. Where the activity-specific baseline is used, additionality as referred to in paragraph 1, points (a) and (b), shall be demonstrated through specific additionality tests in accordance with the applicable certification methodologies set out in the delegated acts adopted pursuant to Article 8.
Problem	To assess the additionality of an activity, it is necessary to set rules on how to test this. This can comprise several aspects of additionality: • Regulatory additionality (i.e., carbon farming practice should go beyond current obligatory practices) • Financial additionality (i.e., carbon farming practice should be implemented as results of the financial incentive from the carbon certificates) Regulatory additionality is rather straight forward as the activity should go beyond what is the minimum requires by European, national, and regional legislation. The current CRCF proposal states that the incentive effect of the certification is needed for the activity to become financially viable. The methodology should further clarify which rules are required. For financial additionality there are different approaches available and currently no clear EU rules are existing on this topic.
Objective	Development of an criteria-based approach to determine additionality when an activity-specific baseline is used for certification.
What is there already? Existing proven certification methodologies	*UK Peatland Code* A peatland restoration project passes the legal test (regulatory additionality) when there are no laws, statutes, regulations, court orders, environmental management agreements, planning decisions or other legally binding agreements that require restoration, or the implementation of similar measures that would achieve equivalent levels of GHG emissions reductions. Statutory designations, such as SSSI status, are not regarded as legal obligations for restoration. In England, peatland restoration projects established to provide biodiversity credits under Biodiversity Net Gain, or nutrient credits under the Solent Nutrient Market or Somerset Catchment Market are unlikely to be eligible for the Peatland Code as their legal agreements are likely to specify that peatland restoration is required.

	The financial feasibility test aims to determine whether the project would be financially feasible without carbon finance. The assumption is that cost, and revenue are decisive factors in the decision to take restoration measures. A peatland project passes the test when the project can demonstrate via financial analysis that no more than 85% of the project costs over its duration are covered by income other than carbon finance. The remaining minimum 15% shall come from carbon finance. Costs and revenues used within the financial analysis shall be based on current, local, prices. *KlimaMoor* includes regulatory as well as financial additionality tests. *Currency for Peat* uses three levels of verification of the project specific baseline for operators, considering financial incentives by offering cheaper and more expensive verification options.	
What are the options?	Pros	Cons
Option A: Add a financial attractiveness test to existing legal tests to assess additionality	• conservation management that includes active rewetting will result in avoided emissions and therefore be covered. • The opinion that a financial arrangement (subsidy, certification) is not financially interesting often becomes apparent when the arrangement is open for submissions of projects. With this option you can tailor the financial arrangement to increase the attractiveness for the operator. • If they do not need the carbon finance then the project would go ahead anyway, if they do need the carbon finance then the pass this test Example: In the Netherlands, subsidy schemes have been created in the past with the aim to reduce freshwater demand in agriculture (Veraart et al., 2017). After opening the scheme, the number of subsidy applications is sometimes lower than expected and only then the applicants state the reasons why this is the case.	• The problem is often how to reward conservation managed peatlands that do not require active rewetting measures and instead of focus on keeping them in such a state that functions to maintain net sequestration (i.e., avoided damage rather than avoided loss). • You may leave out a large group of operators, with also a GHG reduction potential, who face greater uncertainties and who want to try something unusual/innovative to achieve emission reductions.
Option B: Add a non-financial barrier test to existing legal tests	This option is in the revised CRCF proposal not relevant anymore.	

Option C: Common practice test	• Probably results in more effective use of money for carbon farming practices. • More innovative practices are stimulated. • For the use of credits for compensation it can be a requisite that the reduction of emissions would otherwise have not taken place.	• Data to demonstrate this might be not easily available. • Although a certain practice might be considered a common practice, there might be barriers to other farmers that cannot implement it and carbon certificates might overcome that (financial) barrier.
Option D: Conservative Issuing of Carbon Credits/Pending Carbon Credits	• The conservative approach in issuing carbon credits (Currency for Peat) is also a manner to guarantee a balance between financial attractiveness and additionality. The conservative approach guarantees that no credits are generated that are not fully covered by real reductions/removals because emission assessment always involves uncertainties. • the conservative approach stimulates the development of better monitoring techniques and methodologies, because a reduction of the uncertainty increases the size of the awardable reductions/ removals. • UK Peatland Code make distinction between 'Pending Carbon Credits' (issued before verification after 5-10 years) and 'Carbon Credits'. You can buy 'Pending Carbon Credits' but you may not use them.	• The conservative approach and pending approach have the disadvantage that less credits are awarded than in reality reductions/removals are realized. • "Pending carbon credits" refer to "carbon credits" that are sold before the reductions/removals are factually realized. They can therefore not one-to-one be used for compensating actual emissions.
Option E: No additionality test	• Some of the experts stated that an additionality test is not needed for peatland rewetting, because rewetting is always additional. For farming there is often no revenue model. A situation in which an operator can make a profit from rewetting without carbon credits is, in the current situation, unlikely.	• There is a risk that some operators will incorrectly receive carbon credits, in the situation where there is a revenue model in the future. • Property should be considered: who is the owner of the Carbon Credit.
Option F: use existing legal test of relevant environmental policies to test additionality	• No additional administrative burden. • Leading criteria for sustainability should indeed be	• Additionality in terms of policies can be problematic because obligations such as Natura 2000 plans do not mean

<table>
<tr>
<td></td>
<td>the regional legislation, tailored to the regional context.</td>
<td>that rewetting was in fact going to take place.
Often outdated, all conservation directives and rules come from a time when climate change was not the primary objective.
Leading criteria for sustainability should indeed be the regional legislation, but this is sometimes outdated.
All conservation directives and rules come from a time when climate was not the primary objective. How to deal with conservation issues, e.g. sometimes habitat reversing is still emitting a lot of carbon.</td>
</tr>
<tr>
<td>Summary of focus group feedback</td>
<td colspan="2">General consensus:
Financial attractiveness test - Those involved in certification in the UK and Ireland already apply a financial attractiveness test and they see the benefit of it. Others do not apply a financial test (the Netherlands) and some experts expressed hesitations.
When applying such a test distinction should be made between rewetting of natural areas and rewetting of peatlands in agricultural use.
If applied the financial attractiveness test should be as simple as possible.
Good behaviour should be rewarded.
Common practice test – not discussed.

Other options:
The Dutch C-credit scheme (SNK Currency for Peat) tests additionality in terms of existing and planned policy (and common practice in some cases).
Instead of tests, preconditions can also be set on international benchmarks. UK Peatland code uses for example VCMI (Bio-Integrity) and 'Core Carbon Principles';
No harm test: in case of rewetting, damage compensation might be necessary for the neighbouring farmers.
The question if it would be relevant to demonstrate that a project activity is not common practice (e.g., not more than 20% in a region) was not discussed.</td>
</tr>
<tr>
<td>Open questions</td>
<td colspan="2">Are common practice tests suitable in CRCF methodologies?</td>
</tr>
<tr>
<td>Next steps</td>
<td colspan="2">Define additionality tests</td>
</tr>
</table>

4.3 Feedback Expert Group on additionality topic

Experts mentioned that a ‘common practice’ test is not suitable to be implemented in European certification methodologies, due to the large variation and innovation in agricultural practices. Others argued that no financial tests are necessary since rewetting is always additional compared to land use of drained peatlands.

5. Long term storage

5.1 Introduction

The proposal by the Commission notes that biogenic carbon that is captured and stored through a carbon removal activity, or activity to reduce emissions, is at risk of being released back into the atmosphere (i.e., reversal) due to natural or anthropogenic causes. Therefore, operators (i.e., owners of carbon removal activities) should take all relevant preventive measures to mitigate those risks and duly monitor that carbon continues to be stored over the monitoring period laid down for the relevant carbon removal/emission reduction activity. The validity of the certified carbon removals should depend on the expected duration of the storage and the different risks of reversal associated with the given activity.

To account for this risk, the validity of the certified carbon removals generated by carbon farming should be subject to an expiry date matching the end of the relevant monitoring period. Thereafter, the carbon should be assumed to be released into the atmosphere, unless the economic operator proves the maintenance of the carbon storage through uninterrupted monitoring activities (CRCF, Article 6(3)). The CRCF proposal also notes that emission reduction activities shall be subject to appropriate monitoring rules and liability mechanisms (Article 6(3a)).

To incentivise synergies between Union climate and biodiversity objectives, enhanced monitoring of land is required, thereby helping to protect and enhance the resilience of nature-based carbon removals throughout the Union. The monitoring of emissions and removals need to closely reflect those approaches and should be based on an appropriate combination of on-site measurements with remote sensing or modelling according to rules set out in the appropriate certification methodology. It should make the best use of advanced technologies available under Union programmes, such as Copernicus, making full use of already existing tools, and ensure consistency with the national GHG inventories (CRCF proposal, Recital 10).

In addition to measures taken to minimise the risk of carbon release into the atmosphere during the monitoring period, appropriate liability mechanisms should be introduced to address cases of reversal. The certification methodologies should also include rules on the risk of failure of the liability mechanisms. Such mechanisms could include collective buffers and up-front insurance mechanisms. (CRCF proposal, Recital 14).

Alignment with LULUCF methods - The general rule in the LULUCF regulation is that where land use is converted, countries can change the land use from ‘land converted into wetland' into ‘wetland remaining wetland’ after **20 years**. When countries report a land use change from wetland to forest, a 30-year conversion period can be applied in future. N_2O emissions from peatlands (with function nature) are often assumed to be not significant in LULUCF reporting because fertilizers are not used in natural areas. That is a plausible assumption for peatlands that are designed as protected areas for a <u>long time</u>. When it concerns newly developed nature areas on former agricultural land, changes in nitrous oxide emissions (reductions) can be significant in the first years, depending how rewetting measures are applied. This is also a point of attention in the certification methods in relation to long term storage.

Activity period and monitoring period

The activity period is defined as the period over which the activity generates a net carbon removal benefit or a net soil emission reduction benefit. The monitoring period is the period over which the storage of carbon or emission reduction is monitored by the operator. During the activity carbon removal units are created which have a set year of validity. The monitoring ensures the carbon removal units are valid during and after the activity. For example, a forest activity happens from 2030 to 2040 and the carbon removal units created have a validity of 10 years. Removal units created in 2040 are valid till 2050. So, monitoring must continue at least until 2050 to ensure the removal units created in 2040 are still present in the forest. But no new removal units will have been created between 2040 and 2050.

5.2 Minimum duration of the activity period

Definition	The activity period is the period over which the carbon removal / reduction activity generates a net carbon benefit in the form of carbon removal or a soil emission reduction. *Related to Annex I (a) type of activity and description of the practices and processes covered, including its activity period and monitoring period.*
Problem	• The reviewed carbon certification methods (Annex B) use different time spans for the activity period and monitoring period over which CR_{total} is determined in peatlands. • How to deal with inter-annual variability in emissions to quantify results? In years with dry summers, the risk of over- or underestimating GHG-emissions in (rewetted) peatlands will be higher than in wet years (chapter 3.5). From a financial perspective: Do you average the risk of under-certifying or over-certifying carbon removals over a longer or shorter time period? Key question: What should be the minimum duration of the activity period?
Objective	The minimum duration of the activity needs to be determined to ensure that the emission reduction is achieved for a significant period after an initial dynamic transformation period associated with a change in land use or management. Determining the activity period is important to ensure that carbon removals are not overestimated (or underestimated) in relation to a fixed baseline.
What is there already? Existing proven certification methodologies	**Outcomes of the certification review** **MoorFutures**: The project crediting period of MoorFutures projects is 30-100 years. A minimum of 30 years is required to cover possible transient dynamics (methane spike, colonisation of new species). If the project includes afforestation/reforestation or improved forest management (including harvesting), the length of the project crediting period must include at least one complete harvest cycle. Projects shall have a reliable and well-designed plan for management and implementation over the entire project crediting period.

<table>
<tr><td></td><td colspan="2">Currency for Peat: certification period is at least 10 years for areas with an agricultural function and a maximum of 50 years for areas with a nature function. For areas with a nature function the baseline needs to be evaluated and adjusted periodically (every 10 years). In case of the agricultural function, it is conceivable that a higher water level will be made mandatory for agricultural areas in organic crop lands in the future. In that case, the baseline for new projects must be adjusted. A balance is sought between accurate determination of long-term emission reduction on the one hand and investors' need for reasonable investment security on the other. That is why in this method for projects with agricultural function a period of 10 years has been chosen, for which additionality and baseline are determined. After the 10-year period, additionality and baseline are reassessed for another 10-year period. Should a policy change take place in the course of a period, for example after 8 years, it will only be incorporated into the project plan of an ongoing project during the review after 10 years. The 10-year period is used in line with other similar projects and programmes, such as the Verra certification system (formerly the Verified Carbon Standard (VCS)). Moreover, 10 years is a period in which nature has the opportunity to develop. Latest information, as incorporated in the updated method document, applies immediately to new projects.

UK Peatland Code: certification period is a minimum of 30 years. The minimum peat depth for projects to be eligible under the Peatland Code is 30 cm in blanket and raised bogs and 45 cm in fens, so to claim emissions reductions over more than 30 years is therefore necessary to provide evidence that the project duration shall not exceed complete loss of the peatland resource within the project site in the ‘do nothing’ baseline scenario.</td></tr>
<tr><td>What are the options?</td><td>Pros</td><td>Cons</td></tr>
<tr><td>Option A: shorter term activity period (<30 years)</td><td>• Baseline will not change as much as with longer periods.
• Most practical for agricultural operators.</td><td>• Higher risk that carbon is released again sooner, i.e., after the activity ends.
• Unpredictable and uncontrollable factors have larger effect on performance.
• Ecosystem has less chance to “settle into” new conditions (e.g., spike in methane emissions after rewetting, which decreases again after several years).</td></tr>
<tr><td>Option B: long-term activity period (>30 years)</td><td>• Carbon reduction for a longer period.
• The risks of, for example, GHG releases due to drought (interannual variability) can be more easily averaged over a longer period.
• Performance of the activity, baseline, and additionality can be periodically evaluated in shorter cycles (e.g., 5-10 years).</td><td>• Effects of an activity may change over time, for example due to a lack of maintenance or due to environmental changes.
• Baseline can have changed significantly during period.
• The initiator/receiver of the Carbon certificate will be a different person/entity that the person who started the project.</td></tr>
</table>

Summary of focus group feedback	There was consensus in the focus group that activity periods should last at least 10 years. This is a minimum duration for the ecosystem to stabilise after a change in land use. However, a longer duration is preferred, and a brief period is only applicable when the site remains in agricultural use. Consensus seems to be to aim for a period of 20 years for activities with agricultural use, balancing the carbon benefits and uncertainties from a business-point of view. It is inevitable that during the activity the baselines and operators will change. The effects of which can be mitigated by re-evaluating performance and baseline intermittently. It was mentioned that the peat depletion time in the 'business as usual' scenario should be considered when a rewetting activity is applied. But any carbon credit scheme can only protect what is currently present, so a scheme cannot run for longer than 30 years if 'business as usual' would result in depletion of 1 cm per year on a 30 cm peat soil. This is to insure against failure of the project. The focus group (06-10-2023) recommended a longer timeframe for measuring methane emissions in the developing certification scheme. *Discussion by authors:* • Two options were mentioned to deal with the risk of CH_4 peaks after changes in management: (a) to apply the management change only gradually over time. This would lower the risk of CH_4 peaks, but also slow down reductions in CO_2 emissions. This approach would therefore only be viable if a longer activity period is used; or (b) to use a precautionary principle in which fewer carbon credits are rewarded in the first years of the activity when a CH_4 peak occurs.
Open questions	What are the relevant preventative measures to mitigate risks of reversals of activities, need to be provided for each activity type, if operators are expected to implement these.
Next steps	Define more in details the activity period for diverse types of peatland/wetland activity.

5.3 Minimum duration of the monitoring period

Definition	'Monitoring period' means a period, the duration of which is determined in accordance with the type of carbon removal activity, over which the soil emission reduction or storage of carbon is monitored by an operator or a group of operators and which covers at least the activity period (Article 2(f), CRCF proposal). Carbon removal units from a carbon farming activity are only valid during the monitoring period; after the end of the monitoring period, the units are not valid any longer. From annex I of CRCF proposal: certification methodologies shall include: (h) rules on monitoring and mitigation of any risk of release of the stored carbon referred to in Article 6(2), point (a). (ib) rules on monitoring of soil emission reductions referred to in Article 6(3a).
Problem	Permanent storage can be at risk after the activity period, for example, when the hydrological rewetting regime is not continued.

	Key question: Would it be important to include a monitoring period longer that carries over the activity period?	
Objective	A well-designed monitoring system to ensure that a durable increase in carbon uptake or reduction in emissions is achieved because of the project activity.	
What is there already? Existing proven certification methodologies	**Outcomes of the certification review** **ECS KlimaMoor**: monitoring period is for the duration of 50 years (not including specific times in between for monitoring) **MoorFutures**: Vegetation mapping to determine the area fractions of different GESTs is carried out over the entire project period, namely before rewetting, in the third year after rewetting, and then every ten years. **Currency for Peat (SNK)**: monitoring period is the same length as the duration of the project activities. **UK Peatland Code**: regularly measured and monitored over the lifetime of the project (minimum 30 years). As a minimum, monitoring of condition category change shall take place (max 12 months) prior to each verification by the project and shall be conducted as per the Peatland Code Field Protocol. The length of monitoring period is for all certification schemes the same period as the activity period.	
What are the options?	Pros	Cons
Option A: Monitoring and activity period are the same (Based on monitoring period in existing certification schemes reviewed)	• Lower costs for monitoring. • No discussion on liability after the activity period.	• There is a risk that the achieved emission reduction is not prolonged after the activity period;
Option B: Monitoring needs to be continued after the activity period	• Ensure a longer-term reduction in carbon emissions. • Enables long-term continuous quantification of C-dynamics.	• Higher costs. • Legally more complex.
Summary of focus group feedback	A notable distinction between peatlands and other systems in which "carbon farming" takes place, is that in peatlands it is mostly about emission reductions. If emissions are reduced for a period (i.e., during the activity period), then these emissions will remain avoided, even when after the activity ends emissions would increase again. As a result, it makes sense to have a monitoring period which is the same as the activity period. An option to safeguard a long-term reduction in emissions is Member State laws to maintain a rewetted state (or otherwise situation with lower emissions), e.g., if the site becomes a nature reserve.	
Open questions	It should be made clear who is responsible for (the costs of) monitoring, and for rewarding (and discounting) credits	
Next steps	Discuss more in detail how reversal of activities after the activity period can be avoided.	

5.4 Rules for liability mechanisms

Definition	From CRCF proposal, Recital 14: In addition to measures taken to minimise the risk of carbon release into the atmosphere during the monitoring period, appropriate liability mechanisms should be introduced to address cases of reversal. The certification methodologies should also include rules on the risk of failure of the liability mechanisms. Such mechanisms could include collective buffers and up-front insurance mechanisms. To avoid double regulation, liability mechanisms in respect of geological storage and CO2 leakage, and relevant corrective measures laid down by Directive 2003/87/EC and Directive 2009/31/EC of the European Parliament and of the Council1 should apply. From annex I: (i) rules on appropriate liability mechanisms referred to in Article 6(2), point (b), and Article 6(2b), point (c): (b) they shall be liable to address any reversal of the carbon captured and stored by an activity, occurring during the monitoring period, through appropriate liability mechanisms as set out in the delegated acts adopted pursuant to Article 8. The liability mechanisms referred to in paragraph 2, point (b), shall: (c) for carbon storage in long lasting products and for carbon farming, be set out and duly justified in the applicable certification methodology and may include up-front insurance or collective buffers.
Problem	Liability rules need to be in place in case the certified stored carbon is released into the atmosphere, or emission reductions are reversed, before the end of the monitoring period.
Objective	The development of appropriate liability mechanisms to cover for the case in which carbon is released into the atmosphere, or emission reductions are reversed, during the monitoring period. The following mechanisms are considered: 1. Discounting of carbon removal units 2. Collective buffers or accounts of carbon removal units 3. Up-front insurance mechanisms 4. Other suggestions (focus group) In a discount-based approach a certain percentage of calculated/estimated carbon removals is excluded from carbon certification, which compensates for the uncertainty and potential risk on reversal. This amount is not made available for certification after the activity or monitoring period. In a buffer pool approach a certain percentage of the certificates is kept separately, which can be used to compensate potential carbon reversals. If the buffer is not used, the certificates can be assigned to the operators at the end of the activity or monitoring period. In an insurance-based approach, the operator ensures that additional certificates can be bought to compensate in case of carbon losses during the activity or monitoring period.

	Key question: Which liability mechanism is most appropriate for land use change and rewetting at peatlands?	
What is there already? Existing proven certification methodologies	**MoorFutures:** the long-term contracts foresee the liability with e.g., penalties for violation of rewetted site. **UK Peatland Code:** The project shall declare any intention to change the use or management of land elsewhere within the same agricultural/land holding number as a consequence of the peatland restoration activities. If there is an intention for change, the project shall carry out an assessment to determine whether the change will result in significant GHG emissions (≥5% of the emissions reduction over the duration of the project). If significant GHG emissions will occur, they shall be quantified (tCO2e/yr.) for the duration of the project and subtracted from the projected emissions reductions claimed, using the Emissions Calculator.	
What are the options?	Pros	Cons
Option A: Discounting of carbon removal units	• More certainty that the estimated carbon removals are obtained;	• Less incentive for operators to maintain their practices, as there is no final payment.
Option B: Collective buffers or accounts of carbon removal units	• More attractive for operators as it can serve as a bonus for maintaining their practices. • Most existing methodologies use this approach.	• If the buffer is paid out after the certification period, there is less certainty.
Option C: Up-front insurance mechanisms	• Liability is for the buyer and not for the operator.	• More uncertain whether new carbon certificates can be purchased if required in case of a carbon release. • Costly to have an upfront insurance.
Other suggestion: credits are rewarded based on the actions and not the results	• Lower risks for operators. • Operators are not punished for factors outsider their control.	• Risk of awarding credits while emission reductions are lower than expected.
Summary of focus group feedback	As a liability mechanism the collective buffer pool was favoured as it would include multiple projects and would be programme-based. When one project fails, other projects can manage the financial risks. The collective risk buffer needs to be designed in such a way that it incorporates the spatial distribution of the project portfolio. Another aspect of liability is what the rewarded credits are based on. The group prefers action-based payments over result-based payments. In this case operators are not punished if results are not achieved due to factors beyond their control.	
Open questions	-	
Next steps	Design a suitable collective risk buffer.	

5.5 Feedback Expert Group on Liability topic

When it comes to liability, a combination of different mechanisms (discounts, buffer pools and insurance) were favoured. Some experts stress that specific rules should address buffer pools and thresholds for risk reversals. Others object that buffer pools in the past have not worked properly due to incentives to have small, possibly insufficient, buffer sizes. While some experts suggest that units based on actions rather than results are believed to be a way to ensure simpler MRV and easier implementation, the approach is deemed problematic by others.

6.Sustainability

6.1 Introduction

Carbon removals, carbon farming and carbon storage in product activities have a strong potential to deliver win-win solutions for sustainability, even if trade-offs cannot be excluded. Therefore, it is appropriate to establish minimum sustainability requirements to ensure that those activities do not lead to significant harm to the environment and are able to generate co-benefits for the objectives of: climate change mitigation and adaptation; the protection and restoration of biodiversity and ecosystems, including soil health and avoidance of land degradation; the sustainable use and protection of water and marine resources; the transition to a circular economy, including the efficient use of sustainably sourced bio-based materials; and pollution prevention and control. Carbon farming activities should at least generate co-benefits for the objective of protection and restoration of biodiversity and eco-systems, including soil health as well avoidance of land degradation.

Those minimum sustainability requirements should take into account the impacts both within and outside the Union as well as local conditions, and as appropriate, be consistent with the technical screening criteria for do no significant harm principle, and be in line with the sustainability and GHG emissions saving criteria for forest and agriculture biomass raw material laid down in Directive (EU) 2018/2001. Practices that produce harmful effects for biodiversity, such as forest monocultures producing harmful effects for biodiversity, should not be eligible for certification (CRCF proposal, recital 15).

6.2 Minimum sustainability requirements

Definition	An activity shall not significantly harm and may generate co-benefits for one or more of, the following sustainability objectives: (article 7(1)): (a) climate change mitigation beyond the net carbon removal benefit and net soil emission reduction benefit referred to in Article 4(1) and (1a). (b) climate change adaptation. (c) sustainable use and protection of water and marine resources. (d) transition to a circular economy, including the efficient use of sustainably sourced bio-based materials. (e) pollution prevention and control. (f) protection and restoration of biodiversity and ecosystems, including soil health and avoidance of land degradation.

	A carbon farming activity shall at least generate co-benefits for the sustainability objective (f) in the above article (Article 7(1a)).[3]
Problem	To show a neutral impact on sustainability objectives, a carbon removal activity shall comply with minimum sustainability requirements laid down in the certification methodologies, with reference to existing relevant environmental legislation, such as legislation in relation to the Water Framework Directive (e) or the Bird and Habitat directives (f).
Objective	Ensure that the certified activity at least does not compromise or damage other environmental objectives (mandatory). This can be challenging, because the greater the change in the environment caused by the treatment, usually the greater the negative temporary effects, such as an increase in the nutrient export on watercourses caused by a significant rise in water levels.
What is there already? Existing proven certification methodologies	**MoorFutures** prohibits deterioration. The improvement in terms of climate impact should not lead to negative effects on other ecosystem services, including biodiversity. Overall, the socio-economic and ecological conditions in the region should not be worsened. Compliance with the prohibition of deterioration will be presented in the project documentation. **LIFE Orgbalt:** Not directly considered under the current scope of the project, but monetization of the environmental services of particular climate change mitigation scenarios based on the TEEB database is included in the modelling. **Wetlands4Climate:** the management measures applied to strengthen the mitigating service and the capacity to retain carbon should in no case have detrimental effect in the conservation of the ecological status of the wetlands. The assessment of the ecological status of the wetland is therefore carried out following the criteria established in the legislation relative to the protection and conservation of ecosystems: the Water Framework Directive (for the ecological status of waterbodies) and the Habitats Directive (for the conservation status of Habitat Types of Community Interest) **Currency for Peat (SNK)**: as part of the validation process of project plans, it is assumed that the project plans do not infringe the law which, in the Netherlands, covers banning serious negative environmental impact. However, there is no testing of negative environmental impacts implemented by SNK itself as part of the validation of project plans. E*xample: SNK makes distinction between rewetting while maintaining the agricultural function (grassland) and rewetting combined with development of nature (GDSK, 2020). When the agricultural function is maintained the*

[3] In the proposal for the CRCF Regulation which was discussed with the experts in the focus groups Article 7(1a) was not yet formulated. Hence, these discussions, and the here formulated conclusions on this matter, assumed that methodologies had to follow the criterium of doing no significant harm or possibly generating co-benefits for biodiversity and ecosystem restoration.

	prolonged use of fertilizer can be a risk for water quality and it may reduce the sequestration of greenhouse gases. The impact of fertilizer use is laid down in the Dutch implementation of the Water Framework Directive and the Habitat Directive (nitrogen). The SNK scheme states that every carbon removal activity must comply with Dutch environmental law. Rewetting projects where fertilization takes place are subject to a reduction in captured carbon (10%). **UK Peatland Code**: the management plan needs to include a statement of environmental impact, including e.g., biodiversity.	
What are the options?	Pros	Cons
Option A: Assessment of co-benefits from rewetting, e.g., biodiversity, cooling, flood control. An indicator assessment based on literature/experts, including rewarding co-benefits at a later stage	• In line with most existing methodologies, no additional development of assessment framework required. • No costs of monitoring as the co-benefits are based on expert judgement and literature. • The philosophy is to stimulate co-modifications for these extra ecosystem services as a voluntary special service, which may lead to a premium instead of standard credit.	• Selection and assessment of indicators is a study in itself (e.g., also labour intensive). • Requires funding of training and advisory services to do proper sustainability assessments. • More subjective approach (expert judgement). • Other markets and environmental policies (subsidies), already reward co-benefits. • An argument not to include co-benefits as an extra option in carbon certification: If no harm is done and if benefits are created, this already falls under the certification. Including it as an extra option will induce more work and excessive costs.
Option B: Negative list of carbon farming practices	• Easy to apply. Low-cost option.	• Effects of most practices are context specific, e.g. depending on soil type and crop management. If scientific studies are used as a basis, then it may need adaptation to local conditions. • Not all practices will always have a positive or neutral impact on all sustainability

		requirements, many practices might be excluded. • Not in line with a result-based approach • Useful, however, each region will be different so a standard list will be complicated.
Option C: the ICROA (International Carbon Reduction and Offsetting Alliance) criteria for “no net harm principle” (ICROA, 2023)	• Available.	• None were mentioned during the expert meetings.
Summary of focus group feedback	*Summary focus group* For sustainability, some members of the focus group were in favour of using existing environmental legislation. Regarding co-benefits, all members of the group agreed to reward co-benefits based on actions (rather than result-based). Sometimes co-benefits are free, in other cases the co-benefits are rewarded. Also, include stakeholders in the area for minimum sustainability. Co-benefits do not only include environmental values. It was recommended to add societal value, such as intrinsic values, tourism, community connections. Perhaps smaller benefits also to people in the wider community. General consensus: • Nature legislation will guide what the policy for the land will be. The leading criteria for sustainability should be the regional legislation. • Further sustainability requirements should come from stakeholders adjacent to the project: e.g., citizens, nature conservation organizations; farms.	
Open questions	-	
Next steps	Further define sustainability also considering regional situation/legislation and active involvement of the local community.	

6.3 Monitoring and reporting of co-benefits.

CRCF proposal, recital 17: Operators or groups of operators should be able to report co-benefits that contribute to the sustainability objectives beyond the minimum sustainability requirements. To this end, their reporting should comply with the certification methodologies tailored to the different carbon removal activities, developed by the Commission. Certification methodologies should, as much as possible, incentivise the generation of co-benefits for biodiversity going beyond the minimum sustainability requirements, with a view to generate a premium for the certified units, by including for instance positive lists of activities that are deemed to generate co-benefits. These additional co-benefits would give more economic value to the certified units and would result in higher revenues for the operators. In the light of these considerations, it is appropriate for the Commission to prioritise the development of tailored certification methodologies on carbon farming activities that provide significant co-benefits for biodiversity and contribute to sustainable management of agricultural land and forests.

Definition	Monitoring and reporting of co-benefits. *Related to Annex I (k) rules on the monitoring and reporting of the co-benefits referred to in Article 7(3).* Article 7(3): Where an operator or group of operators reports co-benefits that contribute to the sustainability objectives referred to in paragraph 1 of this Article beyond the minimum sustainability requirements referred to in paragraph 2 of this Article, they shall comply with the certification methodologies set out in the delegated acts adopted pursuant to in Article 8. The certification methodologies shall include elements to incentivise as much as possible the generation of co-benefits going beyond the minimum sustainability requirements, in particular for the objective referred to in paragraph 1, point (f), of this Article.
Problem	Assessing and monitoring the co-benefits is not straightforward and will require additional methodologies. For the quantification of biodiversity there are no currently widely accepted approaches and indicators that could be used and there are different views on what biodiversity and ecosystem restoration would comprise. **Key question for focus group**: Which methodological approaches could be used to report/certify sustainability co-benefits, e.g., biodiversity impacts?
Objective	Incentivise co-benefits for environmental objectives by ensuring that they are credibly reported on the certificates as well as a reliable cost-effective monitoring system to assess and monitor environmental benefits and co-benefits.
What is there already? Existing proven certification methodologies	**MoorFutures:** Co-benefits are in several projects quantified and communicated. The credit is still based only on one avoided ton of CO2e. The additional ecosystem services that are addressed in MoorFutures 2.0 are (in brackets: quantification approach): • Improved water quality (estimation using NEST Approach) • flood prevention (modelling of the retention volume) • groundwater enrichment (modelling of the total amount of water) • evaporative cooling (estimation using EEST approach) • increased mire typical biodiversity (estimation using BEST Approach) **Currency for Peat (SNK)**: There is no general approach, methodology or rule in place to monitor additional environmental co-benefits. However, additional criteria must be considered when rewetting takes places at locations where additionality is at stake because of existing nature development objectives as formulated in environmental legislation. Rewetting for the benefit of nature objectives to be achieved will not be reimbursed as the operator already receives subsidy for that objective. Only the additional rewetting (in cm water level) that must be achieved to optimize greenhouse gas sequestration is part of the certification (GDSK, 2020). **ECS KlimaMoor**: co-benefits are recorded and documented. **UK Peatland Code:** With the Peatland Code, wider benefits of peatland restoration projects are 'bundled' with the carbon unit when they are sold (the landowner sells the

	carbon unit with the other benefits 'attached'). Projects shall identify, protect and where possible enhance access to designated and undesignated historic environment features and shall provide an opportunity for, and take account of, inputs from relevant parties during both the project design phase and over the lifespan of the project. Project developers must proactively engage at an early stage with local communities, neighbouring properties and any other important but potentially marginalised groups.	
What are the options?	Pros	Cons
Option A: use of existing Directives/laws	• It is possible to build upon existing indicators. • The Habitats Directive does list species (type, form, extent, etc.) that are indicative of a habitat being in 'good' condition. So, whilst these systems are likely not SACs, the HD could be used as a reference proxy to indicate how 'good' the systems are.	• You must decide whether the co-benefit can be rewarded via the carbon certification or whether this is already happening elsewhere via other environmental subsidies.
Option B: positive list of carbon framing practices with additional biodiversity benefits	• Easy to apply for operators of a carbon farming project. • In line with most current methodologies and incentives for biodiversity (e.g., national eco-schemes).	• Uncertain whether the practices lead to actual improvements for biodiversity.
Option C: additional tools for assessing co-benefits (e.g., biodiversity indicators)	• When the assessment is combined with an additional financial incentive (standard versus premium), this can encourage the operator to make extra efforts. • This option is in line with the modified/adopted CRCF proposal (February 2024). • Co-benefits of rewetting could contribute to the objectives of EU Green Deal policy by maintenance and restoration of multiple ecosystem services such as water buffering, nutrient retention, local climate cooling and habitat provision for rare species, while allowing agricultural production simultaneously (EU Peatland & Cap, 2021).	• This may lead to an additional administrative burden for the operator. • Monitoring systems of multiple ecosystem services are rare.
Summary of focus group feedback	*Summary* The expert group did not express a clear preference for one of the three options. Advantages and disadvantages have been identified for each option. No serious objections have been raised with any of the options. Co-benefits (Biodiversity), receive more emphasis in the adjusted text of the CRCF proposal. This is also in line with the philosophy of (a) the reviewed existing crediting systems (in particular UK Peatland Code) and (b) the advice most of the expert gave us: reward rewetting projects that aim for biodiversity gains.	

Open questions	Should methodologies award additional co-benefits?
Next steps	Develop a cost-effective and scalable methodology for quantitative co-benefit monitoring

6.4 Feedback Expert Group on sustainability topic

The paper presented different approaches to minimum sustainability criteria. The feedback included different perspectives. On one hand experts mention that it is important to have low administrative burden, whereas other experts pointed out that qualitative assessment is not sufficient and were not in favour of indicator assessments based on literature and expert judgment (option A). The feedback regarding negative list (option B) includes comments that a such list needs to be complemented with other indicators, supplemented by DNSH and that many assessments related to ecosystem services needs to be done in a local context.

As for approaches to monitoring and reporting on co-benefits, there is diverging feedback. Experts suggest coherence with taxonomy rules, but also emphasize that some indicators might not be sufficient. While some experts are in favour of a positive list (option B) e.g. due to the possibility of lowering administrative burden and costs, other experts argue that quantification of co-benefits is necessary and favour additional tools for assessing co-benefits (option C).

7. References

Arets, E. J. M. M., J. W. H. van der Kolk, G. M. Hengeveld, J. P. Lesschen, H. Kramer, P. J. Kuikman, and M. J. Schelhaas. 2019. Greenhouse gas reporting of the LULUCF sector in the Netherlands - Methodological background, update 2019. In: Statutory Research Tasks Unit for Nature & the Environment (WOT Natuur & Milieu). Wageningen, p. 113.

Batjes et al., 2023. International review of current MRV initiatives for soil carbon stock change assessment and associated methodologies. ORCaSa Deliverable D4.1 https://www.isric.org/sites/default/files/ORCASA_D4-1_FinalDeliverable_InReviewByEU_0.pdf

Bosma, R. H. 2017. Aquaponics en de vele randvoorwaarden voor succes. AQUACULTUUR 28.

Burba, G. (2013). Eddy covariance method for scientific, industrial, agricultural, and regulatory applications: A field book on measuring ecosystem gas exchange and areal emission rates. LI-Cor Biosciences.

Convention on Wetlands (2021). Global guidelines for peatland rewetting and restoration. H. Joost, E. van Duene (eds.). Secretariat of the Convention on Wetlands., Gland, Switzerland.

De Rosa, D., Ballabio, C., Lugato, E., Fasiolo, M., Jones, A., & Panagos, P. (2024). Soil organic carbon stocks in European croplands and grasslands: How much have we lost in the past decade? Global Change Biology, 30, e16992. https://doi.org/10.1111/gcb.16992

Erkens, G., R. Melman, S. Jansen, J. Boonman, M. Hefting, J. Keuskamp, H. Bootsma, L. Nougues, M. Van den Berg, and Y. Van der Velde. 2022. Subsurface Organic Matter Emission Registration System (SOMERS). Beschrijving SOMERS 1.0, onderliggende modellen en veenweidenrekenregels. Nationaal Onderzoeksprogramma Broeikasgassen Veenweiden (NOBV) (ed.), STOWA, Amersfoort.

European Commission, 2018. Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU.

European Commission, 2022. Proposal for a Regulation of the European Parliament and of the council – establishing a Union certification framework for carbon removals, Brussels 30-11-2022 (COM (2022) 672 final.

EU Peatlands & CAP Network, 2021. POLICY BRIEFING PAPER “DEFINITION OF PALUDICULTURE IN THE CAP.

Evans, C. D., Morrison, R., Burden, A., Williamson, J., Baird, A., Brown, E., ... & Worrall, F. (2016). Final report on project SP1210: Lowland peatland systems in England and Wales–evaluating greenhouse gas fluxes and carbon balances.

Evans, C. D., Peacock, M., Baird, A. J., Artz, R. R. E., Burden, A., Callaghan, N., ... & Morrison, R. (2021). Overriding water table control on managed peatland greenhouse gas emissions. Nature, 593(7860), 548-552.

FAO, 1998. World reference base for soil resources. Available at: https://www.fao.org/3/w8594e/w8594e00.htm

Fiedler, J., Fuß, R., Glatzel, S., Hagemann, U., Huth, V., Jordan, S., ... & Weymann, D. (2022). BEST PRACTICE GUIDELINE Measurement of carbon dioxide, methane and nitrous oxide fluxes between soil-vegetation-systems and the atmosphere using non-steady state chambers.

Fritz, C., J. Geurts, S. Weideveld, R. Temmink, F. Bosma, F. Wichern, F. Smolders, and L. Lamers. 2017. Meten is weten bij bodemdaling-mitigatie. Bodem 2.

GDNK. 2018. Methode voor vaststelling van emissiereductie CO2-eq - CO2-emissiereductie via verhoging grondwaterpeil in veengebieden ('Valuta voor Veen'). Greendeal Nationale Koolstof Markt.

GmC, 2022. Fact sheet: The role of methane in peatland rewetting. Editors: Couwenberg, J., Jurasinski, G., Greifswald More Centre, available at: https://www.greifswaldmoor.de/files/dokumente/Infopapiere_Briefings/202211_Fact%20sheet_GMCUR_Methan_English.pdf

Günther, A., Barthelmes, A., Huth, V., Joosten, H., Jurasinski, G., Koebsch, F., & Couwenberg, J. (2020). Prompt rewetting of drained peatlands reduces climate warming despite methane emissions. Nature communications, 11(1), 1644.

Günther, A., Koebsch, F., Vytas, H., Jurasinski, G., 2023. Hot or not – How do we want to rate the climate effects of peatland rewetting?.EGU-2023

ICROA (2023).ICROA endorses puro earth and social carbon-standards. See also PDF (login required).

IPCC, 2014. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (chapter 1) Methodological Guidance on Lands with Wet and Drained Soils, and Constructed Wetlands for Wastewater Treatment. IPCC, Switzerland.

Järveoja, J., Peichl, M., Maddison, M., Soosaar, K., Vellak, K., Karofeld, E., ... & Mander, Ü. (2016). Impact of water table level on annual carbon and greenhouse gas balances of a restored peat extraction area. Biogeosciences, 13(9), 2637-2651.

Jungkunst, H. F., Flessa, H., Scherber, C., & Fiedler, S. (2008). Groundwater level controls CO2, N2O and CH4 fluxes of three different hydromorphic soil types of a temperate forest ecosystem. Soil Biology and Biochemistry, 40(8), 2047-2054.

Jurasinski, G., Günther, A., Huth, V., Couwenberg, J., Glatzel, S. (2016) Greenhouse gas emissions. In: Wichtmann, W., Schröder, C., Joosten, H. (eds.) Paludiculture - Productive Use of Wet Peatlands. Schweizerbart Science Publishers, Stuttgart, 79–93.

Jurasinski, G., K. Byrne, B. H. Chojnicki, J. R. Christiansen, V. Huth, H. Joosten, R. Juszczak, S. Juutinen, A. Kasimir, L. Klemedtsson, W. Kotowski, A. Kull, M. Lamentowicz, A. Lindgren, R. Linkevičienė, A. Lohila, U. Mander, M. Manton, K. Minkkinen, J. Peters, F. Renou-Wilson, J. Sendžikaitė, R. Šimanauskienė, F. Tanneberger, R. van Diggelen, H. Vasander, D. Wilson, D. H. Zak, and J. Couwenberg. 2023. Active afforestation of drained peatlands is not a viable option under the EU Nature Restoration Law. Available at:

https://www.researchgate.net/publication/371608187_Active_afforestation_of_drained_peatlands_is_not_a_viable_option_under_the_EU_Nature_Restoration_Law

Van Huissteden, J. 2022. Chapter 7 NOBV year report 2022 - Climate effect of combined CH4, N2O and CO2 emission change by land use or ecosystem transition. Nationaal Onderzoeksprogramma Broeikasgassen Veenweide. (NOBV) (ed.), Vrije Universiteit Amsterdam, Amsterdam, p. 25.

Kreyling, J., F. Tanneberger, F. Jansen, S. van der Linden, C. Aggenbach, V. Blüml, J. Couwenberg, W. J. Emsens, H. Joosten, A. Klimkowska, W. Kotowski, L. Kozub, B. Lennartz, Y. Liczner, H. Liu, D. Michaelis, C. Oehmke, K. Parakenings, E. Pleyl, A. Poyda, S. Raabe, M. Röhl, K. Rücker, A. Schneider, J. Schrautzer, C. Schröder, F. Schug, E. Seeber, F. Thiel, S. Thiele, B. Tiemeyer, T. Timmermann, T. Urich, R. van Diggelen, K. Vegelin, E. Verbruggen, M. Wilmking, N. Wrage-Mönnig, L. Wołejko, D. Zak, and G. Jurasinski. 2021. Rewetting does not return drained fen peatlands to their old selves. Nat Commun 12: 5693.

Lee, J. S. (2018). Comparison of automatic and manual chamber methods for measuring soil respiration in a temperate broad-leaved forest. Journal of Ecology and Environment, 42(1), 1-6.

Liu, H., N. Wrage-Mönnig, and B. Lennartz. 2020. Rewetting strategies to reduce nitrous oxide emissions from European peatlands. Communications Earth & Environment 1: 17.

Magnan, G., Garneau, M., Le Stum-Boivin, E., Grondin, P., & Bergeron, Y. (2020). Long-term carbon sequestration in boreal forested peatlands in eastern Canada. *Ecosystems*, *23*, 1481-1493.

McDonald, H. et al. 2021. Certification of Carbon Removals. Part 2: A review of carbon removal certification mechanisms and methodologies. Vienna: Environment Agency Austria

McGrath, M. et al., The consolidated European synthesis of CO2 emissions and removals for the European Union and United Kingdom: 1990–2020. ESSD, 15, 4295–4370, 2023 https://doi.org/10.5194/essd-15-4295-2023

Ministerie van LNV (2019). Gebiedsplan voor het IBP Vitaal Platteland Project: Verbetering Landbouwgronden door Ophoging met slib uit de Eems-Dollard (VLOED). Groningen: E20 D50

Ojanen, P., & Minkkinen, K. (2020). Rewetting offers rapid climate benefits for tropical and agricultural peatlands but not for forestry-drained peatlands. *Global Biogeochemical Cycles*, *34*(7), e2019GB006503.

Oldfield, E.E., A.J. Eagle, R.L Rubin, J. Rudek, J. Sanderman, D.R. Gordon. 2021. Agricultural soil carbon credits: Making sense of protocols for carbon sequestration and net greenhouse gas removals. Environmental Defense Fund, New York, New York. edf.org/sites/default/files/content/agricultural-soil-carbon-credits-protocolsynthesis.pdf.

Strack, M., Keith, A. M., & Xu, B. (2014). Growing season carbon dioxide and methane exchange at a restored peatland on the Western Boreal Plain. Ecological Engineering, 64, 231-239.

Tuittila, E. S., Komulainen, V. M., Vasander, H., & Laine, J. (1999). Restored cut-away peatland as a sink for atmospheric CO 2. *Oecologia*, *120*, 563-574.

UNEP. 2022. Global Peatlands Assessment: The State of the World's Peatlands - evidence for action towards the conservation, restoration and sustaible management of peatlands. Nairobi, p. 425.

Veraart, J. A., R. van Duinen, and J. Vreke. 2017. Evaluation of Socio-Economic Factors that Determine Adoption of Climate Compatible Freshwater Supply Measures at Farm Level: A Case Study in the Southwest Netherlands. Water Resour Manag 31: 587-608.

Annex A: Overview of certification methods from the review

Overview of certification methodologies for peatland (EU Survey and review studies)

ID	Short name	Development level:	Country / Geographical focus	Validated against standard:	Eligible practice(s)
	Provided by EU Survey respondents:				
1,54	MoorFutures	Applied at scale	DE	ISO 14064, VERRA VM0036	Rewetting of drained peatlands reduces emissions of greenhouse gases (GHG). MoorFutures are carbon credits that map these emission reductions. Net carbon removal by new peat accumulation is also possible, but in a much smaller scale and conservatively not yet included in the credit.
18	Wetlands4climate	pilot	Int	*No*	Carbon components considered are soil (especially fossil carbon accumulated in peat), aboveground and belowground biomass, and optionally deadwood and litter. Greenhouse gases considered are CO_2, CH_4, and N_2O. Individual stocks and gases may be omitted from the calculation, provided that it is shown that this is conservative (i.e., that the emissions reductions from the project are underestimated)
48	LIFE OrgBalt	Pilot	Int	*No*	Paludiculture; Semi-natural regeneration; Agroforestry; fast growing species in riparian buffer zones; Conversion of cropland used for cereal production into grassland; legumes in conventional farm crop rotation; Strip harvesting in pine stands; Forest regeneration (coniferous trees) without reconstruction of drainage systems; Continuous cover forestry on peatland; Shifting to continuous cover forestry on peatland. GHGs: CH4, N2O, CO2.
55	SNK Currency for Peat	Applied at scale	NL	SNK	Specific practices: restoration, management of vegetation, management of soil, management of water (like re-flooding)
121	ECS KlimaMoor	Applied at scale	Int	ISO 14064 (by end 2023)	GHGs eligible for certification: CO_2 and CH_4
	Added from other sources:				
p1	UK Peatland Code	Applied at scale	Int	ISO/IEC 14065 and EA-1/22 Peatland Code v1.2 (v2.0 under review)	Restoration of blanket bog or raised bog with an associated baseline condition of actively eroding, draining, modified bog, drained cropland, in- and extensive grassland. Fens with an associated baseline condition of drained cropland, in- and extensive grassland and modified fen. GHG emissions used in the calculation of emissions factors include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), dissolved organic carbon (DOC) and particulate organic carbon (POC).