CLIMATE CHANGE
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Final report

Analysis of ten selected crediting methodologies for climate-friendly soil management

Annex to the final report “Funding climate-friendly soil management: Appropriate policy instruments and limits of market-based approaches”

by:

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Abstract: Analysis of ten selected crediting methodologies for climate-friendly soil management

This report is an Annex to the report „Funding climate-friendly soil management: Appropriate policy instruments and limits of market-based approaches" which constitutes the final report of the research project "Nature-based solutions for climate protection: market-based instruments to support climate-friendly soil management" (FKZ 3721 42 502 0). It presents the detailed assessment of ten crediting methodologies on climate-friendly soil management measures which the final report builds upon. The rules and methodologies of ten selected crediting methodologies are assessed against a set of guiding questions/indicators. These guiding questions relate to key challenges that need to be taken into account in the design of funding instruments for climate-friendly soil management in order to deliver robust mitigation results that also deliver social and environmental benefits. The guiding questions build upon the methodology for assessing the quality of carbon credits developed under the Carbon Credit Quality Initiative (CCQI) and comprise 1) questions related to general characteristics of the crediting programme, 2) questions related to approaches for quantifying emission reductions or removals, 3) questions related to approaches for assessing additionality, 4) questions related to approaches for addressing non-permanence, 5) questions related to approaches for avoiding double-counting, 6) environmental and social impacts and 7) governance questions. A synthesis of the analysis is included in the final report of the project.

Kurzbeschreibung: Analyse von zehn ausgewählten Zertifizierungsmethoden für klimafreundliche Bodennutzung

Dieser Bericht ist ein Anhang zu dem Bericht "Funding climate-friendly soil management: Appropriate policy instruments and limits of market-based approaches", der den Abschlussbericht des Forschungsprojekts "Naturbasierte Lösungen (NbS) im Klimaschutz: Marktanreize zur Förderung klimaschonender Bodennutzung" (FKZ 3721 42 502 0) darstellt. Er präsentiert die detaillierte Bewertung von zehn Zertifizierungsmethoden für Maßnahmen der klimafreundlichen Bodennutzung, auf die der Abschlussbericht aufbaut. Die Regeln und Methoden von zehn ausgewählten Zertifizierungsmethoden werden anhand einer Reihe von Leitfragen/Indikatoren bewertet. Diese Leitfragen beziehen sich auf die wichtigsten Herausforderungen, die bei der Gestaltung von Finanzierungsinstrumenten für klimafreundliche Bodennutzung berücksichtigt werden müssen, um robuste Minderungsergebnisse zu erzielen, die auch soziale und ökologische Vorteile bringen. Die Leitfragen bauen auf der im Rahmen der Carbon Credit Quality Initiative (CCQI) entwickelten Methodik zur Bewertung der Qualität von Kohlenstoffzertifikaten auf und umfassen 1) Fragen zu allgemeinen Merkmalen der Methodik/des Zertifizierungsprogramms, 2) Fragen zu Ansätzen für die Quantifizierung von Emissionsreduktionen oder Kohlenstoffentnahme, 3) Fragen zu Ansätzen für die Bewertung der Zusätzlichkeit, 4) Fragen zu Ansätzen für die Behandlung der Nicht-Dauerhaftigkeit, 5) Fragen zu Ansätzen für die Vermeidung von Doppelzählungen, 6) Fragen zu ökologischen und sozialen Auswirkungen und 7) Fragen zur Governance. Eine Synthese der Analyse ist im Abschlussbericht des Projekts enthalten.

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List of abbreviations

ACCO	Alberta Climate Change Office
ACCU	Australian Carbon Credit Unit
ACoGS	Avoided Conversion of Grasslands and Shrublands
ACR	American Carbon Registry
AEOR	Alberta Emissions Offset Registry
AFOLU	Agriculture, Forestry and Land-Use Change
AGES	Austrian Agency for Health and Food Safety
ANREU	Australian national registry of emissions units
ARB	California Air Resources Board
C	Carbon
$CaCl_2$	Calciumclorid
CAE	carbon estimation area
CAP	Common Agricultural Policy
CAR	Climate Action Reserve
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalents
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRT	Climate Reserve Tonnes
DEAL	Departments of Environment, Planning and Housing
DREAL	Regional Departments of the Environment, Planning and Housing
ERAC	Emission Reduction Assurance Committee
ERF	Emission Reduction Fund
ERT	Emission Reduction Ton
ERU	Emission Reduction Unit
ETS	Emissions Trading System
EU	European Union
FPIC	Full, prior and informed consent
GGIT	Greenhouse Gas Implementation Tool
GHG	Greenhouse gas
GIS	Geographic information system
GL	Guidelines
Gt	Gigatonne
GWP	Global warming potential

ha	Hectare
ILUC	Indirect land use change
IPCC	Intergovernmental Panel on Climate Change
ISO	International Standardization Organization
JIN	Joint Implementation Network
LbC	Label bas Carbone
LCA	Land Conservation Agreement
LDC	Least Developed Country
LLC	Limited Liability Company
LMS	land management strategy
LUF activity requirement	Land use & forests activity requirement
LULUCF	Land use, land use change and forestry
MRV	Monitoring, Reporting and Verification
Mt	Megatonne
Mt CO_2e	Megatonne Carbon Dioxide Equivalents
MTES	French Ministry for Ecologic and Solidary Transition
N	Nitrogen
N_2O	Nitrous oxide
NbS	Nature-based solutions
NDC	Nationally Determined Contributions
NGO	Non-governmental organisation
NRT	Nori Carbon Removal Tonne Agreement
NWE	North-West Europe
ODS	Ozone-depleting substances
PIA	Project Implementation Agreement
PPR	Prairie Pothole Region
SDGs	Sustainable Development Goals
SEP	Soil Enrichment Protocol
SOC	Soil organic carbon
SOCREF	SOC reference values
t	Tonne
TAC	Technical Advisory Sub-Committees
TGC	Technical Governance Committee
TIER	Technology Innovation and Emissions Reduction System
UNDP	United Nations Development Programme
UNFCCC	United Framework Convention on Climate Change
USDA	US Department of Agriculture
VCS	Verified Carbon Standard

VVB	Validation & Verification Body
WWF	World Wide Fund for Nature

1 Crediting methodologies for promoting climate-friendly soil management

This report is an Annex to the report „Funding climate-friendly soil management: Appropriate policy instruments and limits of market-based approaches" which constitutes the final report of the research project "Nature-based solutions for climate protection: market-based instruments to support climate-friendly soil management" (FKZ 3721 42 502 0). It presents the detailed assessment of ten crediting methodologies on climate-friendly soil management measures which the final report builds upon.

1.1 Approach to analysis

In the following sections, the rules and methodologies of ten selected crediting methodologies are assessed against a set of guiding questions/indicators. These guiding questions are based on key challenges that need to be taken into account in the design of funding instruments for climate-friendly soil management in order to deliver robust mitigation results that also deliver social and environmental benefits.[1] They are clustered into the following seven topics, comprising a set of guiding questions/indicators that are evaluated:[2]

1. General description and scope of the methodology[3],
   - Geographical coverage of the methodology
   - Use of the mitigation results
   - Types of climate-friendly soil management measures covered
   - Jurisdictional vs. project-based approach
   - Ex ante vs. ex post crediting
2. Analysis of the methodology's approaches for quantifying emission reductions or removals
   - How are quantification methods established?
   - Is the principle of conservativeness applied?
   - Is the principle specified that one carbon credit represents one metric tonne of carbon dioxide (CO_2)?
   - How is uncertainty treated?
   - How is the project boundary defined? How is the risk of leakage managed?

[1] As part of the research project „Naturbasierte Lösungen (NbS) im Klimaschutz: Marktanreize zur Förderung klimaschonender Bodennutzung", a separate report discusses key challenges that need to be considered in the design of funding instruments. These include overarching issues (land use competition, impacts on soil health, biodiversity impacts, ownership and rights to use of soil as well as social impacts) and issues that are particularly relevant for results-based payment approaches (additionality, determining the SOC content of soils, baselines, carbon leakage, non-permanence, double counting, jurisdictional vs. project-based approaches and ex ante vs. ex post crediting). For further details see www.umweltbundesamt.de/publikationen/Funding-climate-friendly-soil-management.

[2] The guiding questions build upon the methodology for assessing the quality of carbon credits developed under the Carbon Credit Quality Initiative (CCQI), see https://carboncreditquality.org/methodology.html.

[3] A more detailed overview of the characteristics of the selected programmes is included in the final report.

- How are baselines calculated? How are past management practices taken into account, also to avoid perverse incentives (crediting sequestering activities after extensive depletion of soils)?
- Do baselines take into account existing (and potential new) policies as well as mitigation targets? Are baselines set for the duration of the crediting period?
- What is the maximum time span for crediting periods?

3. Analysis of the methodology's approaches for assessing additionality

- Are mitigation activities excluded that are required by any law, regulation or other legally binding mandates?
- Are rules in place for assessing whether legal requirements for the respective mitigation activities are in place?
- Are mitigation activities excluded that are incentivised by subsidies or other financial benefits?
- Are additionality tests in place?
- Which role do the revenues from carbon credits play relative to other revenues (financial additionality)?

4. Analysis of the methodology's approaches for addressing non-permanence

- For how long is monitoring of projects required (beyond the crediting period)?
- For how long are project owners or other entities liable for compensating for reversals?
- Are project owners primarily liable for compensating for reversals?
- Are (pooled) buffer reserves in place? How are these capitalised and how do they operate?
- Are risk assessments in place to determine the likelihood of reversals?
- Are project owners required to have legal titles to the land or are legally binding agreements needed that require project owner's consent to undertake any measures that might lead to intentional reversals?
- Are rules in place in case of insolvency/dissolving of the standard or the project owner?

5. Analysis of the methodology's/programme's approaches for avoiding double counting

- Are carbon credits used for purposes for which double counting (e.g. with host country Nationally Determined Contributions (NDCs)) needs to be avoided?
- Is a well-functioning registry in place including a serial number/unique identifier, transparency of issuances, transfers and cancellations, information on owners of credits, status of credits, and vintage of credits as well as information on the project?
- Is the purpose for which credits are used documented?
- Are provisions in place to avoid double registration of a project under different programmes and for transition of projects between programmes?

6. Analysis of the methodology's environmental and social safeguards

   - Are requirements in place to identify and mitigate potential negative social or environmental impacts?
   - Are social/environmental safeguards in place?
   - Is an impact assessment of social and environmental effects/additional benefits required?
   - Is monitoring of social/environmental impacts required at least throughout crediting periods?
   - Is a grievance mechanism in place throughout lifetime of the project?
   - Is stakeholder consultation required before decision to implement project and validation?

7. Analysis of the programme's governance

   - How does overall programme governance work? Is there a (professional) secretariat, a board of directors or trustees with oversight over the programme's operation?
   - Are procedures in place for receiving complaints and resolving disputes from stakeholders? Are any types of sanctions in place in case of infringements?
   - Is there transparency related to the operation of the programme (e.g. are methodology documents and project documentations publicly available)?
   - Is third party auditing (validation and verification procedures) robust?

The assessment is made in a descriptive and qualitatively manner; no 'scoring methodology' has been developed. A synthesis of the assessment can be found in the final report to this project (see footnote above).

For the analysis, ten crediting methodologies were selected. The selection was based on representing a variety of methodologies that currently operate on the voluntary (and compliance) carbon market in terms of geographical scope, types of climate-friendly soil management measures covered and elaborateness of the methodologies.[4] The different methodologies vary in terms of the end use of their credits or certificates; the majority of the methodologies generate credits with are primarily used for voluntary offsetting, some (additionally) feed into compliance markets (Alberta, VCS), while one methodology (ERF) facilitates result-based payments by the Australian Government. Beyond the methodologies covered in this analysis, a variety of other methodologies and providers of carbon credits exist that also implement projects to promote climate-friendly soil management.[5] For a number of such standards, particularly those focusing on a local geographical scope, the publicly available methodologies seem to be insufficient for a detailed analysis along the guiding questions outlined above.

[4] See tabular overview included in the final report for this project.

[5] E.g. UK Peatland Code, CO_2-Plus-Zertifikate vom Biomassehof Allgäu e.V., Peatland Code, MoorFutures, Max.Moor; Ebenrain Humusprojekt, Carbon Future, Valuta voor veen, Himmelserde, Stiftung Lebensraum Humusinitiative, HeckenScheck, aESTI, Bayer Carbon Intiative, Nutrien, TruCarbon.

1.2 Analysis of selected crediting methodologies

1.2.1 Gold Standard soil organic carbon framework methodology

The methodology was developed by Gold Standard, a global private non-profit organisation founded by World Wide Fund for Nature (WWF) and other international non-governmental organisation (NGOs). The method was approved in 2020, however no certificates have been issued as of 13 October 2022.

Key methodology documents

- **Soil Organic Carbon Framework Methodology** (Version 1.0, 2020), main document describing the requirement to quantify changes in greenhouse gas (GHG) emissions and soil organic carbon (SOC) through agricultural practices (method-specific, referred to as "Methodology")[6];
- **Increasing Soil Carbon Through Improved Tillage Practice** (Version 1.0, 2020) presenting requirements to quantify GHG emissions by changing tillage practices (method-specific, referred to as "Improved Tillage Practice")[7];
- **Principles & Requirements** (Version 1.2, 2019), outlining principles and requirements for all project developers and projects or programmes including the validation and verification bodies (programme wide, referred to as "Principles & Requirements")[8];
- **Safeguarding Principles & Requirements** (Version 1.2, 2019) outlining the overarching-safeguarding principles for all projects (programme wide, referred to as "Safeguarding Principles & Requirements")[9];
- **GHG emissions reduction & sequestration product requirements** (Version 2.1, 2022); the document provides specific rules and requirements for specific products considering emission reduction and removals (method-specific, referred to as "product requirements")[10];
- **Land use & forests activity requirements** (Version 1.2.1, 2020), establishing requirements for eligible forestry and agriculture activities to undergo design and performance certification (method-specific, referred to as "Land use and forests (LUF) Activity Requirements")[11];
- **Stakeholder consultation and engagement requirements** (Version 2.1, 2022), specifying requirements for stakeholder consultation and engagement for projects seeking certification (programme wide, referred to as "Stakeholder Consultation")[12];

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

[7] https://globalgoals.goldstandard.org/standards/402.1_V1.0_LUF_AGR_AM_SOC-Module-Improved-Tillage.pdf

[8] https://globalgoals.goldstandard.org/standards/101_V1.2_PAR_Principles-Requirements.pdf

[9] https://globalgoals.goldstandard.org/standards/103_V1.2_PAR_Safeguarding-Principles-Requirements.pdf

[10] https://globalgoals.goldstandard.org/standards/501_V2.1_PR_GHG-Emissions-Reductions-Sequestration.pdf

[11] https://globalgoals.goldstandard.org/standards/203_V1.2.1_AR_LUF-Activity-Requirements.pdf

[12] https://globalgoals.goldstandard.org/standards/102_V2.1_PAR_Stakeholder-Consultation-Requirements.pdf

- **Validation/verification body requirements** (Version 2.0, 2021), containing validation and verification requirements for all validation and verification body's (programme wide, referred to as "Validation and Verification Body")[13];
- **Performance Shortfall Guidelines** (Version 1.1, 2020), outlining requirements to address performance shortfall scenarios for land-use and forests projects (method-specific, referred to as "Performance Shortfall Guidelines")[14];
- **Risks & capacity guideline for land use & forest projects** (Version 1, 2017), assessing performance risks related to project non-delivery or reversal of GHGs and other SDG impacts for land-use and forestry projects (method-specific, referred to as "Risk & Capacity Guidelines")[15];
- **Impact Registry,** website outlining all projects and credits registered under the Gold Standard (programme wide, referred to as "Impact Registry")[16].

1.2.1.1 General description

Gold Standard soil organic carbon framework methodology version 1.0 presents requirements to quantify changes in greenhouse gas (GHG) emissions and soil organic carbon (SOC) stocks through the adoption of improved agricultural practices. This SOC methodology is applicable for a broad range of activities, from small scale, low tech land use to industrialised, large scale land management, using a variety of SOC improvement approaches. The method is not limited to a specific activity but provides flexibility to apply the most current and best-fit systems. It covers removals through additional carbon sequestration as well as emission reductions through agricultural practices (e.g. nutrient management). The standard is applicable worldwide.

Monitoring of methane (CH_4) and nitrous oxide (N_20) is not required, but in principle all GHGs shall be monitored (Methodology p. 10). Soil organic carbon is the only carbon reservoir covered. Above and below ground woody biomass only covered in relation to leakage (Methodology p. 10). The method is project-based, with the project boundary set by the project participant at the edge of selected fields. The method is not limited to a specific activity but provides flexibility to apply a variety of SOC improvement approaches (Methodology p. 3). The methodology covers CO_2 (as a primary gas to be monitored).

According to the standard, the credits are usable for offsetting. The credits are issued ex post and sold by the project developer, who receives the payment directly from the buyer.

Since there have been no certificates issued under this specific methodology, no example project can be described.

1.2.1.2 Approaches for quantifying emission reductions or removals

The Gold Standard Framework proposes three different acceptable quantification methods for determining the increase of SOC content of soils, one using sampling, the others based on modelling. Generally, project owners should select the most specific approach possible with the data available, giving preference to local data sources and models. The

[13] https://globalgoals.goldstandard.org/standards/109_V2.0_PAR_Validation-Verification-Body-Requirements.pdf

[14] https://globalgoals.goldstandard.org/standards/501G_V1.1_PR_Performance-Shortfall-Guidelines.pdf

[15] https://globalgoals.goldstandard.org/standards/203G_V1.0_AR_LUF_Risks-Capacities-Guideline.pdf

[16] https://registry.goldstandard.org/projects?q=&page=1

selection of the approach applied is assessed by the Gold Standard Secretariat at the time of module review.

- **Approach 1:** "Requires on-site measurements to directly document baseline and project SOC stocks."
- **Approach 2:** Uses calculation approaches, datasets, parameters and/or models from peer-reviewed publications to estimate baseline and project SOC stocks. Project owners need to prove that the research results are conservative and applicable to the project site and management practice." Uncertainty deductions are possible, if the uncertainty of SOC change is greater than 20% of the mean value.
- **Approach 3:** "Applies default factors to estimate SOC changes, relating to the general Tier 1/2 model described in the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2019) (Methodology p. 12). If possible, the Tier 2 approach as outlined in the IPCC Guidelines should be applied. Applicability of SOC reference values (SOCREF) to be used in connection with IPCC impact factors shall be transparently demonstrated for the project area." Uncertainty deductions are to be applied if the uncertainty of SOC change is greater than 20% of the mean value.

Sampling is only used in approach 1, however, Gold Standard has indicated it is revisiting validation requirements for Approaches 2 and 3, new were expected in early 2022 that could require soil sampling (Carbon Plan 2021b), however, as of August 2023, these were not available.

The principle that one carbon credit represents one metric tonne of Carbon dioxide equivalents (CO_2e) is stated in Gold Standard's FAQs.[17]

Projects are required to submit a monitoring report at each of the three verification and performance reviews (preliminary review, validation and design review, verification and performance review) which are reviewed by Gold Standard and the Validation & Verification Body (VVB) (Methodology p. 35 f; Principles & requirements p. 29). In addition, the projects must submit an annual report for each monitoring year by the end of the next calendar year. The annual report will be publicly available. The projects must also collect and document evidence that the methodology's applicability is met at all times. This includes requiring that all monitoring data collected must be electronically archived for up to 2 years after the crediting period, while measuring equipment must be certified to national or international standard.

At the time of validation, the projects must document the parameters and models that they have used, in line with Approach 2 or Approach 3 requirements. The VVB assesses whether sampling is adequate to meet methodology requirements (Methodology p. 36).

The **project boundaries** include spatial and temporal boundaries. The spatial boundaries encompass the impacts of activities that are under the project owners' control. Any areas leaving the project during the project duration, i.e. no longer included in monitoring, are conservatively considered full reversals (i.e. loss of all carbon sequestered). The project owner is responsible to maintain or compensate carbon loss to the level of credits already issued. If new areas are added to the project, they have to be documented and certified. The temporal boundary involves the SOC project crediting period of 5-20 years (Methodology p. 10).

[17] https://www.goldstandard.org/resources/faqs.

Leakage is defined as an increase in GHG emissions outside the project area as a result of project activities (e.g. shift of crop production to other lands to compensate for yield reductions or to emissions from increased C runoff). Leakage calculations have to be provided by the Module Activity. Projects are not allowed on wetlands, where C runoff could be an issue (Methodology p. 32f).

- **The methodology allows for purely model-based crediting with high uncertainty.** In general, the project must use a precision of 20% of the mean at the 90% confidence level as the criteria for accuracy of total SOC change calculation. If the methodology for calculating project scenario SOC change results in an uncertainty of more than 20%, an additional uncertainty deduction is applied. The uncertainty analysis is done through a standardised calculation method (Methodology p. 26 f).
- Gold Standard generally requires all projects to determine their baseline scenario whilst applying the conservative principle, which is defined as the "reasonable, conservative scenario that would exist in the absence of the project" (Principles & Requirements p. 9).
- The approval of quantification methodologies within a project is done by an accredited validation and verification body (VVB) while the project design and documentation is reviewed by SustainCERT. The VVB is responsible for assessing the adequacy of the sampling to confirm that the selected approaches are aligned with the methodology requirements and revisit a series of soil pits to verify the project owner's assessment (Methodology p. 36). SustainCERT is the official certification body of Gold Standard, responsible for reviewing the project design as well as its documentation and requesting clarifications and the resolution of corrective actions where required.[18]
- To be eligible to become a VVB, a VVB must hold a valid accreditation that is recognised by Gold Standard, which is laid out in the Validation and Verification Body Requirements (Validation and Verification Body p. 10).

The baseline is set based upon the continuation of the historical land management practices (in the last 5 years before the project start date) with no safeguards to avoid perverse incentives. Multiple baselines are calculated for each project by stratifying the project area into modelling units (according to soil type, climate zone, land management / cropping system, input levels (e.g. fertilization), and additional factors relevant to specific methods, e.g. tillage practices, soil properties (e.g. nutrient status or soil health), hydrology, risk of carbon loss (e.g. fire risk). For each modelling unit, SOC measurements have to be performed and/or modelled. Baselines can be calculated using any of the three quantification approaches described above. Baselines are required to include CO_2; CH_4 and N_20 may be required depending on the activity type; baselines do not include potential leakage emissions sources (e.g. cultivation of SOC building crops onto certified fields while reducing these measures elsewhere on the farm land) (Methodology, p. 13f). It is not clear how past management practices are taken into account before and during the 5 years of the baseline scenario to avoid perverse incentives on crediting SOC activities after depletion of soils.

1.2.1.3 Approaches for assessing additionality

All Gold Standard projects have to demonstrate that they would not have been implemented without the benefits of carbon certification (Methodology p. 35). Project developers must either use a United Framework Convention on Climate Change approved (UNFCCC-approved) or a

[18] https://globalgoals.goldstandard.org/certify-a-project/

Gold-Standard approved additionality tool to demonstrate project additionality (Principles and Requirements p. 16ff). Baseline Scenarios should consider relevant applicable legislation and how effectively these are enforced (Principles & Requirements, p. 9). While there are no provisions related to systematically checking whether new legal requirements have come into force, legal requirements need to be assessed at design certification renewal, if the baseline scenario is re-assessed. The relevant baseline scenario is the continuation of the historical land management practices that are being followed in last 5 years before the project start date (business as usual) (Methodology p. 13). Projects which are business-as-usual cannot earn Gold Standard certificates (Principles & Requirements p. 17).

The methodology offers three different options to demonstrate project additionality

- Option 1 – Clean Development Mechanism (CDM) tools
- Option 2 – positive list (meet requirements (a), (b) and (c) in the list below and at least one of the requirements from (d) to (g) to apply option 2.)
  - (a) The project is located in a Least Developed Country (LDCs) or in a region with a recent United Nations Development Programme (UNDP) Human Development Indicator11 below 0.8. AND
  - (b) The project shall have no intention of creating a forest for the commercial use of the timber or non-timber forest products. AND
  - (c) The project activities shall not be mandatory by any law or regulation, OR if it is mandatory, it shall demonstrate that these laws or regulations are systematically not enforced. AND
  - (d) The project is located in a region with a mean annual precipitation of less than 600 mm. OR
  - (e) The soil pH of the planting area is less than 4.0. OR
  - (f) The planting area is planted with minimum 5 different native tree species in mixed stands, covering at a minimum 50% of the planting area. OR
  - (g) The project area is located in a country or region with a recent UNDP Human Development Indicator 12 below 0.5, OR in a Small Island Developing State (SIDS)13.
- Option 3 – activity penetration. This option is only possible if annual GHGs reductions are less than 6000 t CO_2e. The project is additional when activity is adopted by less than 5% of farmers in the reference area.

Some risks to additionality are poorly managed by the standard. While ongoing financial need must be demonstrated, other regulatory sources of funding do not need to be assessed (Principles & Requirements, p. 16). Activities can be backdated for 5 years while credits can be backdated for 3 years.

1.2.1.4 Approaches for addressing non-permanence

A buffer, risk assessments, and project owner liability are applied to manage reversals and reduce non-permanence risks, though only for a limited period. The duration of the crediting period is specified on methodology level and ranges from 5 to 20 years (Methodology, p. 10). Monitoring and compensation of reversals is only required through the end of a project's crediting period. The project owner is responsible for maintaining or compensating carbon loss

to the level of credits issued (Product Requirements, p. 17). Reversals and/or performance shortfalls are divided into two scenarios. Scenario one represents a reversal due to force majeure (unintentional reversals e.g. natural disaster like flood or fire) and scenario 2 a reversal due to non-force majeure (intentional reversals e.g. land-use or management change). For both scenarios project owners must compensate the carbon loss to the level of credits either using 1) an equivalent number of Gold Standard certificates of the same project that were not affected or 2) by using an equivalent number of Gold Standard certificates from other Gold Standard projects or 3) by using an equivalent number of Gold Standard certificates available in the compliance buffer pool (for force majeure scenario 1 only) (Performance Shortfall Guidelines, p. 4f).

A buffer reserve is used to manage potential reversals of sequestered carbon (but it is not applied for emission reduction activities) (methodology, p. 34). Project contributions are dependent on a risk assessment to determine likelihood of reversals. For land use and forest projects, 20% of the issued certificates have to be transferred to the buffer reserve. The buffer reserve is non-refundable. Credits from other Gold Standard certified project can be used to contribute the required 20% to the buffer pool in lieu of credits issued to the project in question (Methodology, p. 34; Project requirements, p. 15). As the registry shows, more than 50% of the credits held in the buffer pool originate from projects that do not have a reversal risk. After the end of monitoring, credits remain within the buffer pool without retiring them (personal communication with Gold Standard).

If applicable, baseline and project scenarios must account for the risk of carbon loss (Methodology, p. 13, 20). Risks are categorised into natural disturbance risks, political risks, project management risks, financial risks, and market risks. The Risk & Capacity Guidelines outline the risk assessment methodology. Projects with a high reversal risk are excluded from eligibility. However, the risk assessment does not need to be updated in case of reversals (Risk & Capacity Guidelines).

One key reversal risk that is controlled for is that project owner requires "CO_2 user rights"[19], rights to implement the project activities and legal titles to the land or similar entitlement[20] for the land on which the project activities are implemented (LUF Activity Requirements, p. 11/ section 2.1.9, 2.1.10, Annex B, sections 4.1.1. to 4.1.4). Rules are in place in case the programme ceased to exist, including in the case of bankruptcy (Gold Standard Policy – Dissolution of Standards, not publicly available).

1.2.1.5 Approaches for avoiding double-counting

Approaches to avoid double-counting of credits are specified in the product requirements (Product requirements p. 20f)**.** The avoidance of double claiming with the NDC of a project's host country is mandatory unless certificates are issued in 2020 or earlier, prior to the implementation of NDCs. For projects with a vintage of 2021 or later, Gold Standard identifies two specific uses where double claiming must be expressly avoided: 1) use towards an NDC or domestic climate mitigation target other than that of the Host Country, or 2) use by an aeroplane operator towards its compliance obligation under the Carbon Offsetting and Reduction Scheme

[19] CO_2 user rights are rights that grant the titleholder any benefit that could be generated from the certification of the carbon sequestration or greenhouse gas reduction by the project. These rights are not universal rights deriving from or inherently to the ownership of the land, but rather are defined by Gold Standard. For land use projects, the holder of the CO_2 user rights is usually the owner of the land, where the project activity takes place – except when such rights have been expressly transmitted to another person or entity by the land owner, or when an authority act / decision / order / regulation assigns such rights to a different person than the land owner.

[20] It is considered that similar entitlement exists, when 1) A person or entity has been using the land of the project as its owner, for the period of time that the applicable law requires for persons or entity to acquire property by its use, AND 2) neighbours or neighbouring community agrees that the land has been used for such time by the person or entity claiming it.

for International Aviation (CORSIA). To be used for either of these purposes, projects must receive authorisation from the host country and abide by certain Gold Standard requirements in order to avoid double claiming, including reporting and registry requirements. Rules are also in place to avoid double counting due to overlaps of projects with domestic mitigation schemes (Product Requirements, p. 5, 22).

Double registration of project under different programmes is not permitted unless approved by Gold Standard. Project developers must accept the Gold Standard Impact Registry Terms of Use,[21] which includes that units that are listed on the Gold Standard registry are exclusive and cannot be concurrently listed on other registries.

To avoid double counting, a project cannot be included in any other voluntary or compliance standards programme unless approved by Gold Standard (for example through dual certification). If the project area overlaps with that of another Gold Standard or other voluntary or compliance standard programme of a similar nature, the project has to demonstrate that there is no double counting of impacts at design and performance certification (for example use of similar technology or practices through which the potential arises for double counting or misestimation of impacts amongst projects) (Principles & Requirements, p. 6).

Benefits overlap from SOC sequestration activities resulting in SOC increase have to be measurable. If SOC pool impact can be clearly separated between activities (chemical or physical differentiation, geographical separation), separate models or approaches can be applied to calculate cumulative impact (Methodology, p. 34).

There is a well-functioning registry system in place, which includes information on credits, credit provider and buyer, however some important information are not disclosed directly in the registry. All projects are listed on the Gold Standard Impact Registry, which is publicly available (Impact Registry). The Impact Registry includes ID, owner of credit, status of credit, host country, project developer, description of project, project type, methodology. The registry links to external websites (hosted by SustainCert, the VVB), that list exact geographical location (GPS coordinates[22]), emission sources, sinks, GHGs covered and mitigation technologies; however, these are not listed directly in the Registry. The documentation of purposes for which credits are used includes name of beneficiary (business or private person), number of credits, serial number and the project issued to.[23]

1.2.1.6 Environmental and social impacts

General requirements are in place to minimise negative environmental and socio-economic impacts on geographic location, project area, site preparation and food security (Methodology, p. 8-9). These are defined in the SOC activity modules (i.e. more specific methodologies that operate within the Gold Standard SOC Framework), which are still being developed. These can exclude some types of areas, such as wetlands and forests. Biomass burning for site preparation and changes in surface and shallow soil water are not allowed as project activities. To ensure food security, reduction in crop yield is not allowed. In order to demonstrate compliance with safeguarding principles, evidence (such as an Environmental Impact Assessment) needs to be provided to the VVB (Principles & Requirements, p. 10). However, there is no clear guidance on what needs to be covered by an impact assessment.

[21] https://globalgoals.goldstandard.org/standards/T-Preview-V1.1-Registry-App-Terms-of-Use.pdf

[22] Maps including GPS coordinate system and GPS grid have to be included in the project registry but are not publicly available (Principles & Requirements p. 30).

[23] https://registry.goldstandard.org/projects?q=&page=1

Projects need full and uncontested legal ownership of any product (e.g. carbon credits) under Gold Standard certification. Transfer of ownership is possible and must be demonstrated transparently with full, prior and informed consent (FPIC). For certain project types there is a requirement to demonstrate full and uncontested legal land titles/tenure. Title/tenure disputes arising have to be immediately reported (Principles & Requirements, p. 7).

Gold Standards Projects have to be in compliance with host countries' legal, environment, ecologic and social regulations (Principles & Requirements, p. 6). During the validation phase the VVB have to visit the project site to meet the local stakeholders and to identify potential negative impacts on social elements of the local community (Principles & Requirements, p. 38). Baseline and project scenario have to include information on soil properties of the project, e.g. nutrient status or soil health. However, there is no further guidance on how to mitigate impacts on soil quality and health.

The overall methodology involves nine safeguarding principles on social, economic, and environmental/ ecological aspects to identify, prevent and mitigate negative unintended consequences (Safeguarding Principles & Requirements p. 3f). Principle 1 on human rights requires that projects are not supported that violate human rights (Safeguarding Principles & Requirements, p. 9f). Principle 9 touches the issue of environment, ecology and land-use. It features eleven sub-principles that all projects must follow, with a particular focus on the issue of biodiversity. Principle 9.1 (Landscape Modification and Soil) requires identifying function and services provided by the landscape and requires projects to demonstrate no net harm, ensure healthy soils, and minimise soil degradation. Principle 9.10 (High Conservation Value Areas and Critical Habitats) requires projects to have no negative impacts on identified habitats unless certain perquisites are in place. Principle 9.11 (Endangered Species) requires no negative impact on any recognised endangered, vulnerable or critically endangered species (Safeguarding Principles & Requirements, p. 25f).

Several general requirements are in place to mitigate potential negative social and environmental impacts. All projects have to submit Geographic information system (GIS) vector layers including biodiversity areas (a map with a polygon reflecting the boundaries) at the stage of project certification (LUF Activity Requirements, p. 20-21). All projects are required to deliver on climate mitigation in addition to contributing to at least two other Sustainable Development Goals (SDGs). The SDG impact has to be a primary effect and not "one off" (e.g. reduced tillage in the first year of the project only) or an effect generated in design, construction, distribution, start-up or decommissioning of the project (Principles & Requirements, p. 10).

Stakeholders have to be identified, invited and their feedback taken into consideration, including ongoing reporting (Stakeholder Consultation, p. 2). Information provided to them must be culturally appropriate and include i.a., a non-technical summary, technology, objective, scale, duration, and implementation plan (Stakeholder Consultation, p. 7). A grievance mechanism must be established to record concern/grievances during the entire project lifetime. The mechanism has to be agreed with stakeholders and described in the Stakeholder Consultation Report (Stakeholder Consultation, p. 10).

Projects have to provide an annual report for each monitoring year and will be publicly available. The annual reports include a summary, feedback given by stakeholders, list of grievances received, events that impact the outcomes, and legal contests/disputes (Principles & Requirements, p. 26).

Gender policy is in place in the form of safeguarding principle 2 (on Gender Equality and Women's Rights), though it does not specify the monitoring. Projects that contribute to discrimination against women or reinforce gender-based discrimination or inequalities are not

recognised. Projects have to contribute to SDG 5 (gender equality). Projects should not include sexual harassment and/or violence against women, sexual exploitation, human trafficking, slavery, imprisonment, etc., and equal pay for equal work should be respected. Any national gender strategy needs to be considered, and input of expert stakeholders considered (Safeguarding Principles & Requirements, p. 10f).

1.2.1.7 Governance questions

The Gold Standard programme is governed through the following key structures:

- Gold Standard Secretary: Setting the standard/standard design
- Foundation Board: Financial oversight & strategic governance
- NGO supporter network: Advocacy & support from the field (WWF, IUCN, Fairtrade, etc)
- Technical governance: Technical oversight of standard setting & grievances (Technical Governance Committee (TGC), Technical Advisory Sub-Committees (TAC), working groups).[24]

The programme is transparent, with documents and methodologies publicly available and conflict of interest provisions in place. Declaration of no conflict of interest is necessary for expert stakeholders (Principles & Requirements, p. 13) and external validation & verification bodies (Validation & Verification Body, p. 12)**.** Procedures for receiving complaints and resolving disputes from stakeholders needs to be in place and are laid out in the Gold Standard Grievance Procedure. Any stakeholder should be able to make a submission online. The final report of complaints is published on the website.[25] Ultimately, non-conformity with Gold Standard rules and requirements can lead to the deregistration of the project which is then no longer permitted to issue and/or trade carbon units (according to information available on the website, this has happened once so far). All projects are published on the Impact Registry and SustainCERT Platform including project documentation, supporting documentation, and verification report (except confidential information) (Principles & Requirements p. 5, Impact Registry).

The Validation and Verification Body (VVB) must operate in accordance with principles, rules and requirements set out in the Validation/Verification Body Requirements.

Methodology development process[26]: Developers can develop new methodologies, have them approved, and then use them to generate offset credits. This follows a number of steps; firstly, mechanism developers propose a concept method, submitting this to the Gold Standard technical advisory committee; if this is approved, method developers create a full draft and re-submit; two internal and one external reviewer will assess and identify open issues; there may be up to three rounds of review; public stakeholders have 30 days to review and comment; the final step is that the Gold Standard technical advisory committee give final approval of the methodology.

[24] https://www.goldstandard.org/about-us/governance

[25] https://www.goldstandard.org/our-story/grievances-deregistration

[26] https://globalgoals.goldstandard.org/401-sdgiq-methodology-approval-procedure/

1.2.2 Verra Voluntary Carbon Standard: Methodology for improved agricultural land management (VM042)

The methodology was developed for Verra's Voluntary Carbon Standard market, a global private non-profit market that has methodologies for many different types of voluntary mitigation projects (not just agriculture). It was co-developed by Indigo Ag, a private for-profit company. The VCS market has been operating since 2005 and has issued 968 million credits (Verra Registry).

Key methodology documents

- Verified Carbon Standard (2020) **VCS Methodology VM0042 Methodology for Improved Agricultural Land Management**. Version 1.0, is the methodology document (method-specific, referred to as "Methodology")[27]
- Verified Carbon Standard (2022) **VCS Standard v4.3**, establishes general rules and principles for all VCS methods (programme wide, referred to as "Standard")[28]
- Verified Carbon Standard (2022) **Methodology Requirements** v4.1, establishes the requirements for all VCS methods (programme wide, referred to as "Methodology Requirements")[29]
- Verra (2020) **Verra Registry**, the registry of all VCS credits generated by VCS projects (programme wide, referred to as "Registry")[30]
- Verified Carbon Standard (2019) **Agriculture, Forestry and Land-Use Change (AFOLU) Non-Permanence Risk Tool** v4.0[31]
- Verified Carbon Standard (2022) **Registration and Issuance Process**, v.4.1 (programme wide, referred to as "issuance process")[32]
- Verified Carbon Standard (2022) **Program Definitions**, v4.3 (programme wide, referred to as "Definitions")[33]
- **Verra complaints and appeals policy**, a document outlining Verra (and VCS's) organisation wide approach to complaints (programme wide, referred to as "complaints policy"[34]

1.2.2.1 General description

The Verra VCS Methodology for Improved Agricultural Land Management, v1, is a broad method covering many different climate actions.

This methodology was approved in 2020; twenty projects are under development but none have yet issued credits (Verra Registry). The credits are designed to be used as offset or compensation claim credits, with the farmer or intermediary receiving the payment directly

[27] Available at https://verra.org/wp-content/uploads/2020/10/VM0042_Methodology-for-Improved-Agricultural-Land-Management_v1.0.pdf

[28] Available at https://verra.org/wp-content/uploads/2022/06/VCS-Standard_v4.3.pdf

[29] Available at https://verra.org/wp-content/uploads/2022/01/VCS-Methodology-Requirements_v4.1.pdf

[30] Available at: https://registry.verra.org/ (accessed 12.08.2022).

[31] Available at https://verra.org/wp-content/uploads/2019/09/AFOLU_Non-Permanence_Risk-Tool_v4.0.pdf

[32] Available at https://verra.org/wp-content/uploads/Registration-and-Issuance-Process_v4.1.pdf

[33] https://verra.org/wp-content/uploads/2022/12/vcs-program-definitions-v4.3-final.pdf

[34] Available at https://verra.org/wp-content/uploads/Verra-Complaints-and-Appeals-Policy-v1.0.pdf

from the buyer (Standard, p. 4). Certification of mitigation occurs ex post (Standard, p.4). Some state regulators also allow some credits to be used to meet regulatory requirements e.g. Colombia and South Africa carbon tax regulations.

The method covers a wide range of climate-friendly measures: silvoarable agroforestry, use of cover crops, crop rotations with forage legumes, crop rotation with grain legumes, permanent grassland management, residue management, applying manure/compost, improved crop rotation, buffer strips, nitrification inhibitors (urease inhibitor), precision farming, low input grasslands, organic farming, critical external inputs (Methodology, p.7).[35] The methodology covers CO_2, CH_4, and N_2O emissions from soil organic carbon, enteric fermentation, manure, nitrogen fertiliser, and nitrogen fixing species (Methodology, p.11), and the carbon reservoirs soil organic carbon, aboveground and belowground woody biomass (potential) (Methodology, p.10). It thus covers activities that lead to emission reductions as well as those that entail carbon removals. The method is project-based, with the project boundary set by the project participant at the edge of selected fields.

An example project is the Northeast Anhui Improved Cropland Management Project, located in Eastern China (Registry, /app/projectDetail/VCS/4170). The project is large in scale, covering 373,000 ha of wheat and corn fields. Prior to project implementation, management is typified by use of nitrogen fertiliser and straw removal. The project will promote sustainable management practices (e.g. reducing tillage and fertiliser application, and increasing return of straw to soil. This is expected to generate 765,000 t CO_2e per year of mitigation (15 million t CO_2e over the 20-year project duration), that is on average 2 t/ha/yr. The project is being developed by Anhui province with a private local company. It is currently in the process of being validated.

1.2.2.2 Approaches for quantifying emission reductions or removals

The VCS Indigo Ag methodology proposes three different quantification approaches (Methodology, p.18); the farmer can select any of the three. The approach determines how baselines are set and how quantification is done, both to set baselines and calculate carbon sequestration.

- **Quantification Approach 1: Measure and model**: Sampling is used to establish a baseline, and then an "acceptable model" is used to estimate GHG flux based on soil characteristics, agricultural practices, climate, and measured (continuously monitored), measured initial soil organic carbon (SOC) stocks. The methodology does not specify sampling, measurement and estimation procedures, allowing project proponents to select appropriate robust approaches (Methodology, p.86). The methodology does not define a specific model, but provides guidance on what inputs should go into baseline and project scenarios. Project emissions/carbon sink flux are modelled/calculated using the "accepted model" (Methodology, p.38). Required inputs for the model will include measures of soil organic carbon and bulk density (remeasured at least five-yearly, either through sampling or via emerging technology such as remote sensing, with known uncertainty), climate variables from closest weather station, and whatever inputs are needed to capture the impacts of agricultural management activities in the model.

[35] For a critical discussion of these measures see report/factsheets developed under this project available at https://www.umweltbundesamt.de/publikationen/Role-of-soils-in-climate-change-mitigation. For a critical discussion of these measures see report/factsheets developed under this project available at https://www.umweltbundesamt.de/publikationen/Role-of-soils-in-climate-change-mitigation.

- **Quantification Approach 2: Measure and re-measure:** The method proposes this but it is not yet implementable. The proposal is to measure and re-measure soil carbon (i.e. sampling) and compare relative to a "performance benchmark" but this benchmark has not yet been developed.

- **Quantification Approach 3: Calculation**: All GHG fluxes (SOC stocks as well as CO_2, N_20 and CH_4 fluxes) are calculated using a series of equations consistent with IPCC 2019 refinement to 2006 guidelines, which are replicated in the methodology (Methodology, p. 19). There is no sampling, with both the baseline and the emissions/carbon sink flux calculated using 2019 IPCC Guidelines (GL) and default emissions factors (p. 37).

Sampling is only sometimes used and is not required, while when models are used to calculate mitigation, it is not defined what models should be used. Quantification Approach 1 requires sampling for baseline, but not for quantification of impact (though samples must be retaken every five years (Methodology p.85); Approach 2 proposes sampling for baseline and emissions but is not yet implementable; Approach 3 has no sampling (Methodology, p. 19). The methodology does not require specific sampling approaches (e.g. minimum samples per ha), though does require sampling depths of at least 30cm and clearing of organic material before sampling (Methodology, p.85). The methodology calls for sampling to follow best practice, providing example references (Methodology, p.86). Quantification Approach 1 uses modelling but does not prescribe which model, stating instead that it must be publicly available, be shown in peer-reviewed studies to simulate changes in SOC/other gases in method-relevant situations, support full reporting under the method (e.g. versioning etc), and be validated (with calculation of measurement error) against custom built guidance[36] (Methodology, pp. 8-9).

VCS requires methods to identify sources of uncertainty and calculate level of uncertainty and discount uncertain credits. Uncertainty arises from sampling and model prediction error. Sampling error is estimated assumes unbiased sampling, with error a function of level of change and number of samples (Methodology p. 50). Model prediction error is to be estimated based on model experiments that compare modelled and measured site (Methodology p. 50). Where uncertainty is estimated to be greater than 15% (measured as half of the width of the 95% confidence interval), then for every additional percentage point of uncertainty, the rewarded removals decrease by a percentage point (Methodology, p. 48).

Projects are required to have a monitoring plan that establishes how all data will be collected (Methodology, p. 107). Model input data must be monitored and recorded annually. Any qualitative information must be signed off by project operator, while quantitative data must be documented by e.g. management logs, receipts or invoices (Methodology, p. 37); where this is unavailable, the farmer must attest to data provided, or use regional data (Methodology, p. 53). The methodology sets out how each data point should be monitored, and how often (e.g. Livestock grazing days are required to be monitored by recorded in terms of average days per livestock type per year per sample unit, which must be updated every five years, and documented direct consultation from the farmer and written evidence such as management log) (Methodology, p. 97). The monitoring plan must set out the project boundary, which covers all land subject to climate actions under the method, i.e. can cover include multiple "sample units", which are modelled separately (Methodology, p. 20). There is also some consideration regarding

[36] Verified Carbon Standard (2020) MODEL CALIBRATION, VALIDATION, AND UNCERTAINTY GUIDANCE FOR THE METHODOLOGY FOR IMPROVED AGRICULTURAL LAND MANAGEMENT v1.0. Accessed 17.08.2022. https://verra.org/wp-content/uploads/2020/10/VMD0053_Model-Calibration-Validation-and-Uncertainty-Guidance-for-the-Methodology-for-Improved-Agricultural-Land-Management.pdf

actions that go beyond project boundaries e.g. biochar can only come from a set of eligible feedstocks (Methodology, p. 8).

The **crediting period** for improved agricultural land management projects is either seven years, twice renewable for a total of 21 years or ten years fixed (Standard, p. 27).

A historic baseline is set differently for each quantification approach. For example, under quantification approach one, sampling is used to determine SOC stock and density (p. 85). All other properties of the soil to come from soil maps, while climatic inputs to come from local monitoring stations. Calculation should consider factors including crop types, manure type/compost type/nitrogen application rate, tillage depth/frequency, %soil area disturbed/% crop residue removed, irrigation/flooding rate, animal type stocking rate/time grazing. Baselines are set as average of last three years (or last full crop rotation, whichever is longest) (p. 13), i.e. a historical baseline; there are no other considerations of previous land use (e.g. to avoid perverse incentives for depleting soil before baseline setting period). The baseline is required to be re-evaluated every ten years, using regional agricultural production data (Standard, p.11). If there is evidence that the baseline commercial crops are still produced using the same management practices in the region, then the original baseline will still apply; if this no longer applies, a new baseline must be set (in accordance with initial process) (Methodology, p.14). It is not clear in the methodology whether the achieved sequestration results or any reversals are considered in the updated baseline (i.e. - to make sure that only removals that are additional since the last issuance of credits are considered in the next round of issuance).

The methodology has specific rules for managing three types of leakage:

- To avoid **activity shifting** (e.g. applying manure not previously applied): the associated emissions must be deducted unless the manure comes from within project boundaries, comes from an anaerobic lagoon (i.e. avoiding high methane emissions), or the manure would have otherwise been applied and stored outside the project area (Methodology, p. 38).
- To avoid **livestock displacement**: when calculating emissions, the number of livestock is assumed to be at a minimum at the baseline level (i.e. no reduction of animal numbers).
- To avoid **productivity decline:** the project must demonstrate every ten years that average productivity has not fallen by more than 5% since baseline, or that the ratio of project productivity to regional productivity has not fallen by more than 5%. If these declines cannot be explained by a specific cause (e.g. fertilisation rates), then all associated credits are deemed ineligible (Methodology, p. 39).

1.2.2.3 Approaches for assessing additionality

To demonstrate additionality, the project must pass three individualised additionality tests:

- Regulatory additionality: The project must demonstrate "regulatory surplus" (Methodology, p.14; Methodology Requirements, p. 35), i.e. the actions cannot be mandated by law. When a project is renewed, there is no requirement to do a full reassessment of whether new laws have been implemented in the meantime.
- Barrier assessment: The project must list barriers blocking the implementation of new management measures (e.g. social/cultural barriers, risk, uncertainty, access to information), proven with reference to existing studies (Methodology, pp. 14-15).

- Market penetration: The project must demonstrate that the suite of management method changes is not common practice in the region (common practice: weighted average of management changes has greater than 20% adoption rate – this follows CDM definition of common practice) (p. 111). As evidence, project should use government data, scientific literature, research data, industry data – or if lacking, a signed statement from a qualified local expert (Methodology, pp. 15-17).

Additionality is also supported by applicability conditions, which required that projects implement at least one agricultural management practice (e.g. fertiliser, water management, tillage, crop planting, grazing practices) and that land remains in its former land use (Methodology, p.8)

No other additionality tests (e.g. financial additionality) are applied; the project mitigation is considered additional if the above conditions are met. The degree of additionality (i.e. how many removals are recognised) is then determined in comparison to the baseline.

Other regulatory sources of funding, such as the Common Agriculture policy, are not required to be assessed. The only limit is regulatory surplus, i.e. actions must not be mandated (Methodology, p. 14). To avoid double-counting, actions that result in certificates, cannot also be covered by other GHG programs (e.g. cap and trade schemes) (Standard, p. 45).

1.2.2.4 Approaches for addressing non-permanence

Non-permanence during the crediting period is managed by making the project operator liable for intentional reversals. There is no liability for reversals beyond the duration of the crediting period (Standard, p. 14; issuance process, p. 33). Where reversals are intentional, e.g. due to poor management, the project will not receive additional VCUs from Verra until the deficit has been remedied (i.e. mitigation recovers and goes beyond the lost mitigation) (Standard, p. 14).

Project owners must prove they have legal right to control and operate project or programme activities (e.g. ownership under statute, law, right, irrevocable agreement with owner) (Standard, pp. 24-25).

Unintentional reversals (e.g. natural disaster, terrorism) are covered by a buffer account (which is also used to cover non-permanence risk more generally). Where unintentional reversals occur (e.g. natural disaster, terrorism), VCUs equivalent to the reversal are cancelled from the buffer account and the project is set a new baseline; i.e. the project owners themselves are not required to compensate (Standard, p. 13). Non-permanence risk is managed using a pooled buffer account, with a common buffer account used for all AFOLU projects under the standard (Standard, pp. 5-6). In the case of a reversal, buffer credits equivalent to the reversal will be cancelled; non-buffer credits will not be affected (Standard, p. 6). Only carbon stored in pools within the project boundary are considered at risk of reversal (Definitions, p. 12). This applies to emission reductions as well as removal activities (Standard, p. 11f.). For intentional reversals, project owners are obliged to replenish the buffer pool; if they fail to do so, compensation will still be enacted through the pool. The buffer account is periodically reviewed and if necessary revised; any revisions will not apply retroactively but future buffer contribution calculations will reflect any revisions (Standard, p. 6). Credits in the buffer pool are cancelled at the end of the crediting period (Standard, p. 14). Contributions to the buffer account are calculated using a general AFOLU non-permanence risk tool, which calculates a project-specific buffer contribution percentage, based on internal project risk factors (e.g. management, opportunity costs), external risks (e.g. political, land tenure, community engagement, and risk of natural reversals) (Risk Tool, p.2), while the percentage can range from 10-60%, CarbonPlan

report that buffer pool contributions are likely to be around 10% (Carbon Plan 2021a). If the overall risk rating exceeds 60%, the project risk is deemed unacceptably high and the project is excluded from eligibility (Risk Tool, p. 17). The risk assessment must be run at the validation and then re-updated every validation (Standard, p.11). The risk assessment is updated in case of reversals (issuance process, p. 33). The buffer pool only includes credits from projects that have a non-permanence risk.

Some protections against insolvency or short or long-term changes in land operators exist. If a project fails to submit a verification report within five or ten years, a % of buffer credits are put on hold (assuming that the carbon benefits represented by buffer credits held in the AFOLU pooled buffer account may have been reversed or lost); after fifteen years, the credits are cancelled (Standard, p. 14). When a single operator within a grouped project leaves a project, either all previously verified mitigation is assumed reversed, or, the project must monitor the affected project area, and either demonstrate continued storage or assume all reversed (Standard, p. 12). Yet there are no provisions if the programme ceased to exist.

1.2.2.5 Approaches for avoiding double counting

Credits are used for offsetting through a voluntary carbon market, with some controls to avoid double-counting. If they are traded under Paris Article 6 or related programmes (such as CORSIA), projects can apply for a label to be added to their VCUs that will then be shown in the registry by submitting required documentation that demonstrates they meet that programme's additional requirements (Standard, pp.48, 50)[37]. If projects are eligible for multiple GHG-related environmental credit programmes, they must provide VCS with a list of programmes to the validation/verification body. If they have applied for or received credits under another programme, full information on the programme and credits must be given to verification/validation body so they can assure no double issuance (Standard, p. 50). Rules are also in place to address potential overlaps with domestic mitigation schemes of the host country (such as an emissions trading scheme) (Standard, p. 49).

Verra (manager of VCS) manages its own central registry, which transparently lists information on certified projects, issued and retired units, and enables the trading of units (Registry). This records project information (e.g. serial number, location, project status, project type, emissions reductions, area, project promoter, crediting period, as well as project documents) and credits (e.g. issuance date, vintage, ID, project name, country, project type, method, quantity, additional certification, retirement date, beneficiary i.e. buyer, retirement reason) (Registry). The certificate does not clearly list GHGs covered (or whether emissions reductions or removals).

1.2.2.6 Environmental and social impacts

General requirements to minimise negative environmental and socio-economic impacts are set out for all VCS projects. Projects must achieve "No net harm", by identifying potential negative environmental impacts and "tak(ing) steps to mitigate them" (Standard, p.40). This includes a requirement that, "the project proponent or any other entity involved in project design or implementation shall not be involved in any form of discrimination or sexual harassment" (Standard, p. 42).

There are requirements to engage local stakeholders. For all AFOLU projects an impact assessment is required to identify local stakeholders likely impacted and understand legal or customary tenure or access rights, including potential conflicts, as well as stakeholders outside

[37] Requirements for the Article 6 label may include authorisation; the rules are still being developed (see https://verra.org/vcu-labels/).

project area that may be affected (Standard, p. 41). Projects must communicate likely risks to stakeholders and measures to mitigate these (Standard, pp. 41-42) and recognise and support local stakeholders' project rights, have consent, and should not take any action that could exacerbate property right conflicts (Standard, p. 42). Local stakeholders must be consulted before validation, and project proponents must establish ongoing communication mechanisms with stakeholders and demonstrate these and that feedback has been considered at validation and at all verification assessments (Standard, p. 40). In addition, there is a 30-day public comment period for all projects (Standard, p. 40). Communication with stakeholders must be gender-sensitive (Standard, p. 43), and project cannot be involved in any form of discrimination or sexual harassment (Standard, p.42). A grievance mechanism is in place throughout lifetime of the project (Standard, p. 43).

There are also specific protections to protect biodiversity. These include requirements that projects shall not introduce invasive alien species and are required to justify using non-native species and use of inputs that may have negative effects, such as fertiliser and chemical pesticides (Standard, p. 42). Specific eligibility requirements in the methodology also offer environmental and social safeguards. These include requirements that land-use change is not permitted, project cannot occur on land that has been cleared of native ecosystems in the last ten years, and project cannot occur on a wetland (Methodology, p. 8). However, no monitoring of impacts is required.

To demonstrate and advertise broader impacts, project can receive additional certification (e.g. Climate, Community, Biodiversity standard) to demonstrate non-GHG benefits, and label their certificates with this information (Standard, p.40).

1.2.2.7 Governance questions

VCS and Verra's key governance bodies include the following (website, about/overview):

- The Verra Board of Directors and Verra staff hold overarching responsibility for the VCS programme. The Board includes directors with NGO and private sector experience.
- Advisory committees: Verra has many stakeholder advisory committees that should guide development and implementation of the VCS. Relevant examples include the VCS Program Advisory Group (a key overarching stakeholder body that supports the development of the VCS Program); the AFOLU Expert Assessment Panel (Experts that review and advise on AFOLU methods and projects), and the VVB Working Group (features representatives from Validation and Verification bodies).

Methodology development is bottom-up, starting from method developer. The steps include the following (website, /methodologies-main/develop-a-methodology). The steps are the following:

1. Concept: The developer submits a methodology concept; Verra reviews and if evaluation criteria are met accepts into the full approval process,
2. Full method development: Developer drafts and submits full method,
3. Verra review: Verra reviews to ensure "sufficient quality" – e.g. professionally written, aligned with rules etc. Verra charges USD2000 at this point (an additional USD13000 is charged if the method is accepted),
4. Public stakeholder review: The method is online for 30 days for public comment,
5. Validation/verification body (VVB) assessment and final approval: Verra contracts eligible experts to review. Project developer pays them directly (in addition to Verra fees). The

experts review and request changes; project developer responds to any comments and can amend. The VVB produce a final assessment report, which will be reviewed/accepted/rejected by Verra, who give final approval.

There are also processes and requirements for stakeholder involvement and transparency. Projects are required to have communication channels for stakeholder disputes, and demonstrate to verifiers that stakeholder complaints have been considered and addressed (Standard, p. 40). Methodology documents are available to all, as are project documentation including e.g. validation and verification reports (Registry).

All projects must be validated and verified by qualified third parties. Validation occurs before the project is approved, and third-party verification must be carried out every five years. Verification and validation bodies must follow and be qualified under ISO standards ISO 14064-3:2006 and ISO 14065:2013, in addition to VCS regulations (Standard, p. 52).

Verra has a programme-wide complaints process, which any stakeholder, project proponent, methodology developer or others can utilise (Complaints policy, p. 1). The complainant must cover Verra's costs evaluating the complaints if the complaint turns out to be unsubstantiated. Complaints about specific projects or project proponents should be directed to them and only if the complainant is unsatisfied with the result should a complaint be laid with Verra (Complaints policy, p. 2). No information about grievances received could be found.

1.2.3 ACR: Avoided Conversion of Grasslands and Shrublands to Crop Production

The methodology was developed by the American Carbon Registry (ACR), a non-governmental non-profit organisation under the umbrella of Winrock International. The methodology was developed by Ducks Unlimited, The Nature Conservancy, The Climate Trust, Environmental Defense Fund, and Terra Global Capital LLC and adopted by ACR as a private, non-governmental actor. Its first version was approved in 2013.

Key methodology documents

- **Methodology** for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from Avoided Conversion of Grasslands and Shrublands to Crop Production, Version 2.0 (October 2019, method-specific, referred to as "methodology")[38];
- **The American Carbon Registry Standard**: Requirements and specifications for the quantification, monitoring, reporting, verification and registration of project-based GHG emissions reductions and reversals, Version 7.0 (December 2020, programme-specific, referred to as "standard")[39];
- The American Carbon Registry Standard **Buffer Pool Terms and Conditions** (February 2021)[40], describing rules and requirements for the buffer pool (programme-specific, referred to as "buffer pool terms");
- American Carbon Registry (ACR) **Tool for Risk Analysis and Buffer Determination**[41], outlining the principles and guidelines for undertaking a risk assessment and determining

[38] https://acrcarbon.org/wp-content/uploads/2019/10/ACR-ACoGS-v2.0.pdf

[39] https://acrcarbon.org/wp-content/uploads/2023/07/ACR-Standard-v7.0-Dec-2020.pdf

[40] https://acrcarbon.org/wp-content/uploads/2021/02/ACR-Buffer-Pool-Terms-and-Conditions-Jan-2021.pdf

[41] https://acrcarbon.org/wp-content/uploads/2023/04/ACR-Risk-Tool-v1.0.pdf

the contribution of a project to ACR's buffer pool (programme-specific, referred to as "risk tool");

- ACR **Validation and Verification Standard**, Version 1.1 (May 2018)[42], describing ACR's rules and procedures for the validation and verification of projects (programme-specific, referred to "verification standard");
- **Public registry reports** (as of October 2022)[43] that are downloadable from the registry and list information on accredited projects and issued credits according to different criteria (programme-specific, referred to as "registry reports").

1.2.3.1 General description

In 2019, ACR released version 2.0 of its **methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from Avoided Conversion of Grasslands and Shrublands to Crop Production (ACoGS).** The methodology intends to incentivise the avoidance of soil carbon loss and agricultural GHG emissions by placing grasslands under conservation easements that preclude cultivation. The avoided emissions that are quantified relate to the avoided agricultural cultivation, the oxidation of soil organic carbon and the avoidance of several crop production practices such as fertiliser application. Thus, the methodology aims at providing incentives for upholding existing levels of soil organic carbon. Emissions from enteric fermentation and manure deposition are accounted for (Methodology, p. 11). While the title of the methodology refers to emission reductions *and* removals from the avoided conversion of grasslands and shrublands to crop production, only avoided emissions are certified (and not additional removals by increasing SOC stocks compared to a baseline scenario).

So far, 166,197 credits have been issued under this methodology (to one project: **Prairie Pothole**, ACR 222)[44], which is protecting perennial grasslands from conversion into tillage cropland (land use change) in the Prairie Pothole Region (PPR) of North and South Dakota as well as Montana in the USA public registry reports as of October 2022).

Projects that are developed under this methodology need to be implemented within the US (Methodology, p. 13). The methodology follows a project-based approach but projects shall cover larger areas of grassland so that one project proponent is working together with a number of landowners. It covers CO_2 and N_2O from soil management; CO_2 from fossil fuel combustion and CH_4 from livestock emissions can be included optionally (Methodology, pp. 18-19). Soil organic carbon is the carbon reservoir covered; above-ground non-tree, woody biomass; above-ground non-tree non-woody biomass; below-ground, non-tree biomass can be included on an optional basis (Methodology, pp. 17-18).

Credits are designed to be usable for offsetting. Credits are issued ex post, after verification has taken place (ACR Standard, p. 15).

ACR's portfolio covers a large variety of project types and is not only focused on land-based mitigation activities.

[42] https://live-acr-redesign.pantheonsite.io/wp-content/uploads/2023/09/2023.05.29-ACR-VV-Standard_V1.1_May-31-2018.pdf

[43] https://acrcarbon.org/registry/

[44] See https://acr2.apx.com/mymodule/reg/TabDocuments.asp?r=111&ad=Prpt&act=update&type=PRO&aProj=pub&tablename=doc&id1=222

1.2.3.2 Approaches for quantifying emission reductions or removals

The methodology outlines clear **eligibility criteria** and rules to define the geographic **project boundary**. All sources, sinks and reservoirs that are likely to result in a significant increase in GHG emissions or decreased carbon storage in the project scenario must be accounted for in each participant field. The methodology also specifies which carbon pools and GHGs are included and excluded, and which can be included on an optional basis. Specific carbon pools (e.g. above-ground non-tree biomass, soil organic carbon) and GHG sources (e.g. soil management, livestock emissions) do not have to be accounted for if in aggregate the omitted decrease in carbon stocks or increase in emissions is less than 3% of the total ex ante estimate of the GHG benefit by the project (Methodology, p. 16f).

For the quantification of carbon pools and emissions, two types of models are eligible for use under the methodology: process based biogeochemical models (e.g. DAYCENT) or empirical models based on time series measurements and proxy sites. Empirical models may be approved on a case-by-case basis where available. The methodology defines minimum criteria that such models need to fulfil. Output from models should include estimates of uncertainties related to all pools and sources. Otherwise, additional uncertainty analyses should be performed. No explicit minimum requirements for the number of measurements or proxy sites are provided (Methodology, p. 29).

ACR subscribes to the **principle of conservativeness** to avoid overestimating emission reductions and removals as a core accounting principle (Methodology, pp. 16, 18). The ACR Standard specify the GWPs to be used in estimating GHG reductions and removals and declares that a verified emissions reduction *or* removal, serialised and registered as an Emission Reduction Ton (ERT) is denominated in metric tonnes of CO_2e (ACR Standard, p. 14). ACR also has general rules in place to reduce uncertainty related to the quantification of GHG emissions (ACR Standard, pp. 17-18).

ACR's methodology on avoided conversion of grasslands and shrublands to crop production accounts for two **baseline scenarios**:

1. The conversion agent (the actor who would implement the conversion) is identified: proof of intent to convert by the identified agent needs to be provided (Methodology, p. 10). For respective project fields/parcels (i.e. those not listed in Annex B of the methodology), the baseline land-use scenario must be determined and additionality must be demonstrated (Methodology, pp. 22-23). Parameters for determining the baseline are listed in the methodology (p. 24).
2. The conversion agent is not identified but a class of likely agents is identified: the probability of conversion of grassland and shrublands is determined based on historical rates of conversion (Methodology, p. 10). In this case, a standard baseline scenario of cropland for unidentified agents of conversion is applied for the respective project fields/parcels (listed in Appendix B of the methodology and indicated in a map). Projects that apply this scenario do not have to also apply a practice-based performance standard defined by ACR for demonstrating additionality (Methodology, p. 22).

The baseline is valid for the duration of the project term (minimum of 40 years for AFOLU projects with a risk of reversal). The baseline land use scenario may not be adjusted during the project term while the baseline land management scenarios shall be updated at least once every five years for the subsequent 5-year period from the project start date(Methodology, p. 21; 24). According to ACR's regulations, the baseline may not be adjusted in case of a reversal (ACR Standard, p. 32).

The methodology outlines calculation approaches for determining baseline GHG emissions for projects avoiding the conversion of grasslands and shrublands into cropland. Accounting approaches for above-ground biomass, below-ground biomass and soil organic carbon are provided, covering calculations for all carbon pools covered. Baseline emissions for carbon stocks of above-ground biomass can be estimated by approved models, fields measurements, agricultural statistics or values for the annualised average dry matter and carbon fraction for each crop type. For belowground biomass, baseline emissions can be estimated by approved models or be based on the baseline for carbon stocks of aboveground biomass and appropriate root-to-shoot ratios for crop and woody and non-woody components (Methodology, pp. 31-39).

The soil carbon pool is most important for the concerned project type as it is expected to be the primary source of avoided emissions for the project activity. **Baseline emissions from soil organic carbon** can be estimated by approved models, direct measurement of SOC according to guidelines set out in ISO 10381-2:2003: Soil quality sampling – Part 2: Guidance on sampling techniques, or direct measurement according to the approach set out in the ACR Tool for Estimation of Stocks in Carbon Pools and Emissions from Emission Sources. Estimates should be available for the depth at which SOC changes are expected to occur as a result of baseline activities (Methodology, pp. 39-42).

Baseline emissions from soil N_2O emissions may be determined by approved models or equations set out in the methodology. As indirect N_2O emissions from nitrogen fertiliser application are highly uncertain, this pool is excluded from the baseline and project scenario (Methodology, pp. 42-44). Approaches for calculating baseline emissions from livestock due to enteric fermentation are also provided. If livestock was present in the baseline scenario, including this source of emissions would be required (pp. 44-46). An approach for calculating baseline emissions from fossil fuels is also included (pp. 46-47).

The methodology conservatively assumes that avoided conversion results in the maintenance of carbon stocks in the carbon pools included (methodology, p. 47). In the baseline scenario, soil carbon stocks are assumed to decline due to conversion. Soil carbon stocks in the baseline scenario can be calculated either by means of

1. approved models, assuming emissions from SOC proceeding according to the best fit decay curve in the model SOC and for the time up until when SOC levels in the model are changing by no more than +/- 3%, not to exceed 40 years;
2. direct measurement of SOC according to requirements set in an ISO guideline, assuming that emissions proceed linearly for 20 years or
3. direct measurement of SOC according to requirements in ACR Tool for Estimation for Stocks, assuming that emissions from SOC following conversion proceed linearly for 20 years (no specific number of measurements is prescribed) (p. 39f).

Any increase of carbon stocks by project activities is not accounted for, neither for above- nor below-ground biomass nor soil organic carbon stocks (pp. 47ff). Equations for calculating project emissions for all carbon pools covered are provided. To determine initial above ground carbon stocks, models[45], direct field measurements for each biomass type (no specific number of measurements is prescribed), remote sensing or data from government agencies or university extension offices may be used. Project emissions from belowground biomass should be determined based on models or the provided equation and appropriate root-to-shoot ratios for

[45] Eligible models include regional process-based biogeochemical models and empirical models based on time series measurement and proxy sites. Models must be validated for the project region (methodology, p. 29).

crop and woody and non-woody components. Project emissions from soil N_2O are determined by models or the equations provided in the methodology. For livestock emissions from enteric fermentation, the most representative input data should be used and calculation equations are provided. Net sequestration benefits related to livestock are conservatively excluded from the methodology. Manure must be accounted for as part of soil nitrogen emissions. For fossil fuel emissions, a calculation approach is also outlined (pp. 47-58).

To reduce uncertainty of pool and emission estimates, **stratification** can be used (i.e. breaking down of project area into similar "stratas"). If certain process-based biochemical models are used for the quantification of carbon pools, stratification must be used to account for spatial heterogeneity in baseline and project scenarios. The stratification approach must be included in the GHG project plan and will be reviewed during project validation. If soil sampling is used in the project area and the area is not homogenous, stratification may be used to improve the precision of stock estimates, following "best practices" (Methodology, p. 28).

The methodology includes **provisions on leakage**, considering market leakage as the primary leakage risk from the avoided conversion of grassland and shrubland. Conversion is considered to be most likely driven by commodity crops. Such crops are traded and consumed in national or international markets, as opposed to food crops that are consumed locally and could entail activity shifting leakage. A conservative default value for market leakage (specific to the US, 20%) may be used to account for leakage risks. This value is considered to be a conservative estimate of activity shifting leakage where this would be applicable (Methodology, pp. 58-61).

Uncertainty in estimating carbon stocks and emissions is taken into account in the quantification methodology. It is mandatory to estimate uncertainty for each baseline, project carbon pool and GHG sources (pp. 63-64).

The methodology outlines **requirements for monitoring and data collection**. A monitoring plan is developed when a project is validated and submitted at each verification event. It must cover the parameters to be monitored listed in Appendix A of the methodology and cover additional aspects as listed in the methodology. If direct measurements are used in the estimation of GHG emissions, the monitoring plan must specify the sampling design, sample size, plot size and determination of plot locations. If uncertainty exceeds 10% of the mean, estimated GHG benefits or values must be discounted by using the boundary of the confidence interval (Methodology, pp. 66-68).

The methodology outlines specific requirements for **validation and verification** for the specific project type concerned, which supersede ACR's general rules for validation and verification. Validation and verification may be done remotely without a site-visit under certain conditions. A site visit is required before the next issuance of credits upon a reversal or material regulatory violations (Methodology, pp. 69-71).

The **crediting periods** for projects avoiding the conversion of grasslands and shrublands must be at least 5 years and can be up to 40 years. It cannot be renewed (Methodology, p. 21).

1.2.3.3 Approaches for assessing additionality

Additionality needs to be assessed on the basis of two tests.

Firstly, a **Regulatory Surplus Test** is required for all participant fields (Methodology, p. 25). This test requires the project proponent to evaluate whether any regulation is in place that mandates the project action. If a regulatory requirement comes into force during the crediting period that mandates the project activity, the project will no longer be eligible for crediting (ACR Standard, p. 28). It is not further specified how the test should be implemented.

Secondly, ACR's methodology for avoided conversion of grasslands and shrublands includes a **Practice-Based Performance Standard**. All participant fields listed in counties in Appendix B of the methodology (i.e. those for which a standard baseline is applied for quantifying avoided emissions) automatically pass the Practice Based Performance Standard Test and additionality is considered to be demonstrated without providing an additional implementation barrier analysis. Participant fields not located in the counties listed in Appendix B (in the case of unidentified agent of conversion, see section 1.2.3.2) may also pass the Practice Based Performance Standard Test when they can document that conversion via an identified agent is likely. In this case, the performance standard can be used to demonstrate additionality without providing an additional implementation barrier analysis (Methodology, p. 26). ACR will re-assess the performance standard every 5 years.

A **statement of intent** to develop a carbon offset project must be submitted no sooner than 12 months before and not longer than 12 months after the date that a qualified Land Conservation Agreement (LCA) by the respective participant field (i.e. a legal agreement that may be employed to maintain the project land cover during the crediting period) is signed (Methodology, p. 12). According to ACR's regulations, AFOLU projects must be validated within three years after the date when the project proponent began planting or site preparation (ACR Standard, p. 20).

No evidence could be found that other regulatory sources of funding need to be assessed.

1.2.3.4 Approaches for addressing non-permanence

The methodology aims to certify avoided emissions by avoiding the conversion of grasslands and shrublands to crop production. In the context of avoided emissions, reversals occur if carbon is released to the atmosphere that was supposed to remain stored due to the project activities. To manage reversals and reduce non-permanence risks, **projects are required to maintain, monitor and verify project activity for a minimum project term of 40 years**, regardless of the duration of the crediting period (ACR Standard, p. 31). **All types of reversals (intentional and unintentional) must be compensated for** (Buffer Pool Terms and Conditions, pp. 2-3).

ACR has a pooled buffer reserve in place as the main instrument for mitigating the risk of reversal. The fraction of credits to be placed in the buffer is determined through a project-specific risk assessment (Buffer Pool Terms and Conditions, p. 2). Different types of AFOLU projects from various US states as well as provinces in Brazil contribute to the buffer. After the period for which monitoring is required, credits in the buffer pool are retired (Buffer Pool Terms and Conditions, p. 4). In case ACR was no longer operational, its parent organisation Winrock International would take over the administration of the buffer pool (Buffer Pool Terms and Conditions, p. 1).

Project owners are primarily liable for compensating for reversals by replenishing the buffer pool by the estimated amount of the reversal in case of intentional reversals. The amount of reversals ("lost offset amount") must be determined by the project owner and thereafter be verified by a VVB. For unintentional reversals, project owners are required to pay 10% of the lost offset amount if this amount exceeds the buffer contributions by the project owners, while the buffer covers the rest of the reversal. If project owners do not fulfil their obligations, their accounts may be frozen and compensation will happen through the buffer pool (Buffer Pool Terms and Conditions, pp. 2-3). Project owners are required to sign a legally binding Reversal Risk Mitigation Agreements that obliges them to compensate for reversals, providing greater assurance that compensation by the project owners will actually be implemented (ACR Standard, p. 32). Under certain circumstances, ACR additionally accepts insurance as a risk mitigation mechanism (ACR Standard, p. 33).

ACR has a risk assessment in place that i.a. assesses the risk of reversal for a specific project. The ACR Tool for Risk and Analysis and Buffer Determination outlines the methodology for such a risk assessment. The reversal risk is taken into account in the quantification of GHG emissions and in determining the buffer contribution, but there are no general rules in place that exclude projects with a significant unaddressed reversal risk from registration under ACR. The application of the risk assessment is validated by validation and verification entities (ACR Validation and Verification Standard, pp. 23-24). In case of a reversal, the risk category and buffer contribution need to be re-assessed and re-verified (ACR Standard, p. 32).

In calculating net GHG emissions, a **non-permanence deduction** is made in line with the overall project risk rating, calculated by applying the ACR Tool for Risk Analysis and Buffer Determination (pp. 62-63). A project on avoiding conversion of grasslands and shrublands will terminate automatically if a reversal causes project stocks to decrease below baseline levels before the minimum project terms has elapsed (p. 64).

Project owners are required to have legal titles to the land (ACR Standard, p. 83; Methodology, p. 12). The existence of a conservation easement that restricts land management practices that could result in reversals lowers the estimated risk (ACR Tool). The methodology specifies that all participant fields enrolled in the project area must be subject to a qualified Land Conservation Agreement (LCA) entered into by the project participant and prohibiting the conversion of the land (Methodology, pp. 11, 15).

1.2.3.5 Approaches for avoiding double counting

ACR has a well-functioning registry in place that tags each carbon credit with a serial number so that each offset credit is clearly associated with a specific project, country, issuance block and vintage (ACR Standard, p. 94; public registry reports).

Clear rules are in place for identifying the owner of a carbon credit and which entities are entitled to request the issuance, transfer or cancellation of a carbon credit (ACR Standard, p. 58).

The registry transparently documents information on the respective project including information on emission sources, sinks, and greenhouse gases included in the calculation of the project's emission reductions or removals as well as information on the status of the credits (e.g., cancelled or active) and transparent registry reports are publicly available for download (Public Registry reports).

To avoid double registration, ACR requires an **attestation, prior to each issuance, of unique, uncontested "ownership and legal rights" to the mitigation outcomes** as well as that no emissions reductions issued by ACR have been registered or transacted on another registry or by another standard (ACR Standard, p. 58). This is verified as part of the validation and verification process (Validation and Verification Standard, p. 25). Rules are in place for managing the transition of projects from one program to the other (ACR Standard, pp. 58-59).

To avoid double use of credits, the registry has functionalities in place to document the **purposes, beneficiaries as well as goals for which carbon credits are used** (general reason for retirement as well as more specific details). A general reason and information on the account holder that conducted a retirement is always made publicly available. However, account holders are not required to specify the beneficiary of a retirement nor the calendar years to which the credits are used for achieving a voluntary goal or requirement (Registry reports; ACR Standard, pp. 94-95).

To avoid double claiming, the registry provides information on the location and country where a project is implemented, which makes it possible to relate credits to the USA as the

relevant host country. The programme also requires project owners to identify for each carbon credit the calendar year in which the associated emission reductions or removals occurred (ACR Standard, p. 94; public registry reports). ACR also has established provisions for obtaining and publicly reporting **Article 6 authorisations** from host countries (only the USA for the methodology considered) consistent with relevant decisions under the Paris Agreement. The provisions address potential double claiming with host countries' NDCs but the requirements do not apply to offset credits sold to meet voluntary targets. ACR will report information on authorised carbon credits to the host country, including on the cancellation or use of authorised credits. Provisions are in place for qualifying and earmarking credits as eligible for CORSIA in the registry. If evidence for applying corresponding adjustments cannot be obtained by the host country, ACR will evaluate whether to cease qualifying credits from the respective country for those type of uses for which double claiming with the host country need to be avoided (ACR Standard, pp. 59; 94-100; public registry reports).

ACR's standard includes a heading on "avoiding double counting with other GHG programs & registries, emissions trading systems and national or sectoral GHG emissions reduction targets," but no information is provided on how such double counting would be avoided. There are thus **no provisions in place to avoid double claiming with mandatory domestic mitigation schemes of the host country** (ACR Standard, p. 57).

1.2.3.6 Environmental and social impacts

Projects implemented under this methodology additionally are intended to contribute to habitat conservation, sediment retention, water purification, recreation and support to traditional ranching economies.[46] **ACR requires projects to adhere to environmental and community safeguards best practices** to ensure that projects "do not harm", to identify environmental and community risks and impacts and contributions to sustainable development, to detail how negative impacts will be avoided, mitigated, or compensated, to ensure that the rights of affected communities or other stakeholders are recognised and that they have been fully and effectively engaged and consulted and to ensure that ongoing communication and grievance redress mechanisms are in place and that affected communities will share the project benefits. A stakeholder consultation is only required if community-based stakeholders of the project are identified. It needs to be carried out before the validation of the project. There are no guidelines on how a consultation should be carried out. Project owners are required to provide evidence for free, prior and informed consent for the project activity. Project proponents are also required to take any inputs from the consultation into account (ACR Standard, pp. 49-51). The VVB reviews the GHG Project Plan which includes records from stakeholder consultations and how stakeholder comments were addressed. VVBs are not required to engage with affected stakeholders (Validation and Verification Standard, pp. 10; 25; 36-27)

An environmental and community impact assessment is required as part of the GHG plan. Basic requirements and aspects to be covered in the assessment are defined in ACR's standard, including how identified negative impacts shall be assessed and mitigated. Land rights and tenure must be considered as part of the impact assessment. ACR also requires the net environmental and community impacts to be positive. The assessment of impacts should define who will monitor the impacts; but roles and responsibilities for managing environmental and social impacts are not defined (ACR Standard, pp. 49-51). The VVB must check that an assessment has been carried out but does not assess the adequacy and content of the assessment itself (Validation and Verification Standard, p. 25). **Negative environmental or**

[46] See https://americancarbonregistry.org/carbon-accounting/standards-methodologies/methodology-for-avoided-conversion-of-grasslands-and-shrublands-to-crop-production

community impacts must be monitored throughout the crediting period. Impacts or claims of such impacts as well as the appropriate mitigation measure applied must be disclosed in monitoring reports. Project owners must confirm that they did not hide any negative impacts resulting from the project (ACR Standard, pp. 49-51).

A **grievance mechanism** is in place for complaints by ACR stakeholders against decisions made by ACR (complaints about project activities are not explicitly mentioned though). Complaints must be duly considered by programme staff. It is not mentioned that the project owner must consider a grievance made. There is no mention of the possibility to submit complaints anonymously or of a time period in which a response must be made (ACR Standard, pp. 60-61).

If negative impacts have not or cannot be mitigated, ACR reserves the right to refuse to list or issue credits to the project in question (ACR Standard, pp. 49-51).

Winrock, ACR's parent organisation, has a dedicated gender policy in place. There is no explicit reference to gender sensitivity in ACR's provisions on social impacts or for conducting stakeholder consultations, however.

1.2.3.7 Governance questions

ACR is governed by the ERT Board of Managers, which consists of all members of Winrock's Board of Directors.[47] A description of ACR team members and their roles is available on ACR's website.

The programme is transparent, with documents and methodologies publicly available and conflict of interest provisions in place.

ACR requires all management and staff to adhere to its **Code of Professional Conduct** and each director, officer and staff member needs to regularly affirm that they are in compliance with this policy. Any conflict of interest situations must be immediately notified (ACR Standard, p. 15). **Documentation on all projects is publicly available through ACR's registry**. VVB reports must be made publicly available (p. 47). ACR's standard includes **normative references** to publications by the International Standardization Organization (ISO), the Intergovernmental Panel on Climate Change (IPCC) and the CDM which are relevant for the programme's operations (ACR Standard, p. 101).

Additionally, ACR requires that its third-party registry service provider maintain and adhere to a strict conflict of interest policy and that all approved VVBs complete and comply with an Attestation for Validation/Verification Body which defines the VVB's roles and responsibilities and ensures technical capabilities as well as no conflicts of interest. VVBs must also approve a project-specific conflict of interest form for each project they are involved with (ACR Standard, p. 15). ACR requires project proponents to utilise a different VVB at a minimum of every five years (ACR Standard, p. 55). ACR reserves the right to conduct oversight activities of the VVB's operations to ensure quality control and supplement accreditation body oversight and audit processes (pp. 55-56). ACR also has standards in place that define general requirements the VVBs must comply with (Validation and Verification Standard).

To **develop new methodologies**, ACR requires an internal review, public consultation and a blind scientific peer review process. The process of developing the methodology including public and peer review comments and responses are documented on ACR's website. All methodologies must be regularly updated (ACR Standard pp. 45 ff). For methodologies that employ a performance standard for additionality assessment like the methodology on avoided conversion

[47] https://americancarbonregistry.org/about-us/Governance

of grasslands, the validity and underlying assumptions of the performance standard is reviewed at least every five years (p. 47).

Provisions on ACR's grievance mechanism are described in section 1.2.3.6. No information about grievances received could be found.

1.2.4 Ökoregion Kaindorf: Humuszertifikate

Three local Austrian communities have founded the non-governmental association "Ökoregion Kaindorf" in 2007 and set the aim to drastically reduce CO_2 emissions in the region. As part of their mission, they developed their own system for the regional, voluntary trade with CO_2 certificates ("Humuszertifikate").

Key methodology documents

- General website of the programme[48];
- Leaflet Humusaufbau[49] describing the compensation mechanism;
- Agreement which farmers need to sign in order to participate in the programme and be rewarded for humus buildup[50];
- Factsheet summarising the functioning of the programme (from 2020, received through personal communication).

1.2.4.1 General description

Under the programme "Humuszertifikate", local farmers in the region undertake measures in order to sequester additional amounts of carbon in agricultural soils and to build up humus. Farmers can freely choose which measures they want to implement including the use of compost as fertiliser, reducing tillage, improving crop rotation and cover cropping, reducing synthetic fertilisers and pesticides. After verification of these carbon removals (at least an increase of 0.3% humus content), the farmers are paid a remuneration fee (max. 30€ per tonne CO_2 removed). Certificates for such removals are issued ex post and can be bought by firms at a price of 45€ per tonne CO_2 in order to compensate their CO_2 emissions for a defined "compensation period" for which the certificates are valid. 15€ per tonne go to the association as administrative costs (website). Up to 2019, about 7400 certificates have been issued on an area of 3,600 ha of arable land (factsheet).

The programme follows a project-based approach with an own calculation method. The calculation of achieved removals is based on the increase in humus measured (leaflet). Certificates are given out on an ex post basis after CO_2 removals have been verified.

The main aim of the programme is to enhance humus build-up and contribute to soil health while creating a source of income for local farmers to implement sustainable agricultural management practices (website). It is therefore focused on management changes (as opposed to land use changes) and increasing removals (as opposed to reducing emissions).

[48] https://www.oekoregion-kaindorf.at/index.php?id=192

[49] https://www.oekoregion-kaindorf.at/index.php?route=common/download/file&download_id=191

[50] https://www.oekoregion-kaindorf.at/index.php?route=common/download/file&download_id=524

1.2.4.2 Approaches for quantifying emission reductions or removals

The leaflet of the programme outlines the "**mode for calculating CO_2 sequestration**" on half a page. CO_2 sequestration achieved is calculated as follows:

> Area of the plot in m2 x 0.25 (sampling depth in m) x 1.3 (specific gravity of dry soil = variable from laboratory) = dry matter in tonnes x percent fine soil = dry matter fine soil x carbon content (C) in % = carbon in tonnes x 3.67= CO_2 sequestration in tonnes per plot.

Past management practices are not taken into account in calculating the carbon removals. No information is available on how the quantification method has been established.

No eligibility criteria or project boundaries are defined, but the scope of the programme is limited to the ecoregion.

Upon registration for the programme, an initial soil **sampling** is done for each field to determine baseline humus levels (25 GPS-located samples per field). Sampling is conducted by a civil engineer. Soil samples are analysed for soil organic carbon (converted to humus), total nitrogen, pH_{CaCl2}, CAL-extractable phosphorus and potassium by the Department for Soil Health and Plant Nutrition, Austrian Agency for Health and Food Safety (AGES) according to Austrian standard procedures. In addition, samples are analysed according to the method of Albrecht/Kinsey for exchangeable cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}, H^{+}), total sulphur, available and total phosphorus as well as trace elements (B, Fe, Mn, Cu, Zn, Cl, Si, Co, Mo and Se) (Factsheet).

A follow-up sampling (success control) is conducted within two to five years after the initial sampling to quantify changes in humus content. From the increase in humus, the total amount of CO_2 sequestered is calculated (Factsheet). This corresponds to a crediting period of two to five years. Thereafter, farmers are obliged to maintain the increased humus content for at least five years. This is verified by another sampling after five years have expired (Leaflet, p. 7). The sampling is done by a certified third party (ibid; agreement, p. 7).

The participating farmers commits to building up humus of at least 11 tonnes CO_2 per ha (equivalent to an increase of 0.3 percentage points) (website). The payment of the remuneration is contingent upon achieving this rate of humus increase (agreement, p. 6). Farmers are obliged to document specific data throughout the crediting period (agreement, p. 8).

No information is available on how uncertainty is managed. The methodology **does not refer to the principle of conservativeness** in calculating sequestered carbon. **Leakage is not addressed by the methodology**. There are no provisions on the adjustment of baselines.

1.2.4.3 Approaches for assessing additionality

Humuszertifikate does not assess the financial or regulatory additionality of the carbon removals generated. The remuneration fee for farmers represents an additional income for them (website).

1.2.4.4 Approaches for addressing non-permanence

Farmers are required to maintain the increased levels of humus that were built up over a period of two to five for at least another five years. This is controlled for by a third sampling at the end of this five-year period website). Farmers are required to sign a legal agreement with the association specifying their obligations under the programme. If the maintenance of the increased levels of humus cannot be verified after five years, farmers have to refund a proportionate part of the money they received as remuneration (agreement, p. 7). If ownership

rights change during the time the farmer is bound by the agreement, he/she must transfer all obligations to the new rightsholder (p. 8).

The certificates for the sequestered carbon which companies buy voluntarily are only valid for a defined compensation period (i.e. five years). After this period, the purchased certificates are worthless. They may not be traded (website). No further provisions are in place for reducing the risk of reversals.

The certificates can therefore be seen as temporary credits. While buying companies may use the credits for offsetting their own emissions, the certificates are designed to only offset emissions for a very limited period of time. However, it is the buyer's discretion to address this expiry of the certificates used. The programme therefore seems to provide a form of results-based finance rather than credits usable for offsetting emissions in the long run.

1.2.4.5 Approaches for avoiding double-counting

Carbon credits issued by Humuszertifikate are designed to be used by companies to offset their own emissions for a defined and very limited time period. They may not be traded and expire after the time period has elapsed (website). Farmers sign that they will not enter into similar agreements with other organisations and that they will not sell the sequestered carbon as certificates under any other programme (agreement, p. 7).

The selling of certificates is administered via a separate software (website). No further information on a registry and on other forms of potential double counting is available.

1.2.4.6 Environmental and social impacts

No information is available on the use of environmental and social safeguards. No mechanism for stakeholder consultation, the assessment of social or environmental impacts, the monitoring of such impacts or for submitting complaints is in place. A gender policy is not mentioned.

The agreement which farmers need to sign specifies that the received remuneration must be paid back if the change of management practices has negative effects on water quality and if this is accepted intentionally by the farmer. The agreement also obliges the farmer to allow controls by Ökoregion Kaindorf in that respect (agreement, p. 9).

Participating land owners implement the new management practices on their own lands within the small region where the programme is implemented. Conflicts relating to the ownership and rights to the use of soils are therefore also less relevant. A maximum of 2/3 of the price of the certificates go to the local farmers (website).

1.2.4.7 Governance questions

The website of the programme provides information of the team behind the association Ökoregion Kaindorf and its board and makes key documents such as the constitution of the association publicly available.

A code of conduct, provisions relating to conflict of interests or a procedure for receiving complaints and resolving disputes are not in place. The leaflet constitutes the basic information available on the humus programme. Otherwise, no further information on the process of establishing the quantification methodology or documentation on individual humus projects including the calculation of sequestered carbon, third party auditing or the sale of certificates is publicly available.

1.2.5 CAR: Soil Enrichment Protocol (SEP) – Reducing emissions and enhancing soil carbon sequestration on agricultural lands (v. 1.1)

CAR is an **environmental, non-governmental, non-profit organisation** based in California and operating since 2001. It serves as an approved **Offset Project Registry for California's Cap-and-Trade Programme**, applying six Compliance Offset Protocols (ozone depleting substances, livestock, US forest, urban forest, mine methane control and rice cultivation). Additionally, its offset credits (Climate Reserve Tonnes, CRTs) are sold on the US voluntary carbon market (Reserve brochure). In total, CAR has 21 different methodologies in place and three further methodologies are in development, crediting a wide range of mitigation activities, also beyond the land-sector. The programme mainly operates in the US, but five methodologies are applicable for projects in Mexico, one for grassland projects in Canada and one methodology for forest projects in Panama is in development. [51]

Key methodology documents

- **Soil Enrichment Protocol (SEP) website** compiling all documents relevant for the specific methodology[52] (method-specific, referred to as "SEP website");
- SEP: **Reducing emissions and enhancing soil carbon sequestration on agricultural lands** v1.1 (May 2022), describing the methodology for crediting mitigation activities[53] (method-specific, referred to as "methodology");
- **Reserve Offset Program Manual** March 2021, describing the general rules, methodologies and principles of Climate Action Reserve (CAR[54]) (programme wide, referred to as "programme manual");
- **Reserve general brochure** (2022) outlining major characteristics of CAR[55] (programme wide, referred to as "Reserve brochure");
- **Climate Action Reserve Public Registry** (November 2022)[56] (programme wide, referred to as "CAR registry");
- **SEP Project Implementation Agreement** (method-specific, referred to as "PIA")[57];
- **Serial Number Guide** explaining the information contained in the serial number format used by CAR[58] (programme wide, referred to as "serial number guide");
- **Terms of Use** (January 2014) setting out general rules for interacting with CAR (programme wide, referred to as "Terms of Use")[59];

[51] https://www.climateactionreserve.org/how/protocols/

[52] https://www.climateactionreserve.org/how/protocols/soil-enrichment/

[53] https://www.climateactionreserve.org/wp-content/uploads/2022/06/Soil-Enrichment-Protocol-V_1.1-final.pdf

[54] https://www.climateactionreserve.org/how/program-resources/program-manual/#program

[55] https://www.climateactionreserve.org/wp-content/uploads/2022/10/Reserve-brochure-2022-pdf.pdf

[56] https://thereserve2.apx.com/myModule/rpt/myrpt.asp

[57] https://www.climateactionreserve.org/wp-content/uploads/2022/04/Soil-Enrichment-Protocol-PIA-4.20.22.pdf

[58] https://www.climateactionreserve.org/how/voluntary-offset-program/serial-number-guide/

[59] https://www.climateactionreserve.org/wp-content/uploads/2009/03/Final-TOU-1-2014..pdf

- **Verification Program Manual** February 2021, describing general CAR rules and procedures related to the verification of projects[60] (programme wide, referred to as "verification manual");

1.2.5.1 General description

CAR's Soil Enrichment Protocol was **first adopted in 2020**. The methodology was developed for CAR with financial and technical support from the company Indigo Ag Inc. and various other individuals and organisation participated in its development (methodology, acknowledgements). It is **project-based, focusing on agricultural management practices on cropland or grassland that are intended to increase SOC storage and/or decrease net CO_2, CH_4 and N_2O emissions from agricultural activities compared to a baseline in the US** (methodology, p. 3). It thus covers emission reductions as well as removals. Multiple fields may be grouped into one project (p. 6). The methodology covers soil organic carbon as well as a number of emission sources related to soil use (soil methanogenesis, fertiliser use, use of nitrogen fixing species, manure deposition, enteric fermentation, fossil fuel use and biomass burning), but it does not cover above- or belowground biomass, dead wood, litter or wood products (methodology, pp. 27-28). Applicable land management practices include those that result in changes to fertiliser application (organic or inorganic), application of soil amendments (organic or inorganic), water management/irrigation, tillage and/or residue management, crop planting and harvesting (crop rotations, cover crops), fossil fuel usage and/or grazing practices and emissions (methodology, p. 4). A non-comprehensive list of potential project activities includes crop selection and rotation, user of cover crops, reduced tillage, improved fertiliser management, improved irrigation management and improved livestock management.

Credits issued under the methodology are designed to be used **for offsetting**. Credits are issued ex post, after verification has taken place (programme manual, p. 36). As of November 2022, two projects have received credits under the soil enrichment protocol: The "Indigo U.S. Project No.1"[61] developed by Indigo Ag (who played a central role in developing the methodology) has received a total of 22,225 credits by November 2022 and the project "AgriCapture Soil Enrichment #1"[62] on two Arkansas farms developed by AgriCapture Inc has received 32 credits by November 2022. SOC build-up and emission reductions were achieved through changes to crop planting and harvesting, tillage and residue management and changes to fertiliser application (CAR registry). For 2020, press coverage states that credits were sold for USD 20 for 2020[63], while for 2022, a price of USD 40 has been agreed[64]. Payments go to project owners (methodology, p. 8), while according to press coverage, farmers receive 75% of the revenues[65].

1.2.5.2 Approaches for quantifying emission reductions or removals

The methodology sets out clear **eligibility criteria** (detailed in the methodology, section 3, p. 11ff): projects must be located on land which is, as of the project start date, cropland or grassland (including managed rangeland and/or pastureland) and which remains in agricultural

[60] https://www.climateactionreserve.org/wp-content/uploads/2021/02/Verification_Program_Manual_February_2021.pdf

[61] See https://www.indigoag.com/carbon/science/advancement and https://thereserve2.apx.com/mymodule/reg/TabDocuments.asp?r=112&ad=Prpt&act=update&type=PRO&aProj=ipub&tablename=doc&id1=1459

[62] See https://agricapture.com/portfolio/soil-enrichment-protocol-project/ and https://thereserve2.apx.com/mymodule/reg/TabDocuments.asp?r=112&ad=Prpt&act=update&type=PRO&aProj=ipub&tablename=doc&id1=1513 and https://news.agropages.com/News/NewsDetail---44411.htm

[63] https://pressemitteilungen.sueddeutsche.de/indigo-agriculture-4734028

[64] https://www.indigoag.com/pages/news/inaugural-carbon-by-indigo-credit-issuance?hsLang=en-us

[65] https://www.cnbc.com/video/2022/07/11/boston-based-startup-indigo-ag-focuses-on-climate-friendly-farming-funded-by-carbon-credits.html

production throughout the crediting period. Projects may not include areas which been cleared of native ecosystems or other restored or protected areas 10 years prior to the start date. Projects must not decrease carbon stocks in woody perennials. They should not introduce broadscale organic amendments to grasslands. There is no minimum size defined for projects but it is stated that the approaches of the methodology are best-suited for large-scale projects (methodology, pp. 3-4). Individual projects may comprise multiple fields into a larger, aggregated project, coordinated by one project owner. Under certain conditions, fields may change the project they are associated with (methodology, pp. 6-7). Also, requirements related to the project start date are defined (methodology, p. 11).

The methodology contains **criteria for defining the project boundary** (methodology, pp. 4-5). The methodology clearly defines which carbon sources and greenhouse gases are included and excluded and whether these should be modelled (and measured) or calculated (methodology, pp. 27-28). Global warming potentials are specified by the methodology (p. 29) and in the programme manual (p. 16).

SOC stocks and GHG emissions in the project scenario are compared against a **baseline scenario** which assumes the continuation of past management practices (methodology, p. 4). For that purpose, a historical baseline period of at least three years needs to be defined and practices applied in the baseline scenario in that period are determined for each sample unit (such as a field). A model is then used to estimate baseline SOC and GHG emissions on the basis of the historical data. The methodology foresees two different approaches for baseline modelling:

- matched baselines extrapolating baseline crop rotation to the project scenario and
- blended baselines averaging cultivation options represented in the baseline period (methodology p. 15ff).

The baseline must be modelled for each cultivation cycle of the crediting period, so that a baseline is only determined for a specific reporting period and not for future reporting periods (methodology, p. 34).

SOC stocks must be measured upon the start of a project and at least every five years. Stratification may be used in measuring SOC stocks. The sampling approach must be described in the Monitoring Plan and adhere to minimum standards (including the requirement to select at least three sample points per stratum and a minimum sample depth of 30cm) (methodology, p. 73ff). On the basis of these measurements, baseline and project SOC changes are modelled for each cultivation cycle of the crediting period. Other sources, sinks and reservoirs of carbon are quantified each year on the basis of default equations and emission factors or modelling. The SOC pool must always be measured or modelled, however. Project owners must describe how direct measurements and modelling are employed (methodology, pp. 29f). The project monitoring plan must define "sample unit" for the measurement of SOC stocks for the project, including the use of stratification. Quantification is based on a sub-set of the total project area, the sample. Results for sample units are applied across the whole project area by using averages (methodology, p. 33-34). The methodology also includes minimum standards for models to be applied (p. 76f). Models employed in the quantification of emission reductions/removals either need to be applied with the involvement of third-party experts or be assessed by an expert as part of the verification process (methodology, p. 95).

To account for **uncertainties** in the quantification, the number of credits is not based on the calculated average emission reductions but from the 30th percentile of the distribution of the estimated average emissions reduction. This "uncertainty deduction" is intended to ensure that actual emission reductions exceed the credited amount with a probability of 70%, thus

estimating the emission reductions conservatively (methodology, p. 37). The general programme manual also includes the obligation to use conservative assumptions and parameters (p. 17).

Net **GHG emission reductions are calculated separately for reversible and non-reversible sources** (methodology, p. 29). "Reversible emission reductions" are those "related to SOC stock changes" (methodology, pp. 37f). A reversal occurs if the net SOC stock change across the entire project area for a reporting period is found to be negative (methodology, p. 30). Reversible emission reductions can be calculated on the basis of tonne year accounting so that less credits are issued. Alternatively, if the amount of issued credits corresponds to the calculated emission reductions, other mechanisms need to be applied to account for potential reversals of the mitigation achieved (see section 1.2.5.4). For non-reversible emission reductions (reduced N_2O emissions from fertiliser use and biomass burning, reduced CH_4 emissions from the SOC pool, from nature deposition, from enteric fermentation, from biomass burning and reduced CO_2 emissions from fossil fuels), the sources and methods for quantification are the same in the baseline and project scenarios (methodology, p. 47).

Market-shifting **leakage** resulting from reductions in livestock management or crop yield on project lands is accounted for. For that purpose, the level of grazing activity on the basis of which project emissions are calculated may not be lower than average historic levels of grazing activity. To account for leakage due to a yield reduction of crops, project developers need to compare their production levels to average historic production values. In cases of larger deviations, emission reductions calculated for the project are discounted (methodology, pp. 62f).

The methodology also sets out the requirements for a project's **monitoring plan**. It further outlines data parameters that need to be collected for soil enrichment projects. A QA/QC methodology for the data must be developed and approved by CAR and should ensure that the selected data sources do not entail an overestimation of emission reductions (methodology, p. 67-70). Monitoring of land use must be implemented through site visits or remote sensing (p. 70). The typical reporting period for soil enrichment projects is one complete cultivation cycle (p. 86). Also clear requirements for project documentation and reporting are outlined in the methodology (pp. 86ff).

Verification needs to be done at least after five reporting periods (p. 89). The monitoring plan serves as the basis for verification, confirming that the requirements for monitoring have been met (p. 94). The key verification activities are to identify emission sources, sinks and reservoirs, reviewing GHG management systems and estimation methodologies and verifying emission reduction estimates, including the proper use of models and appropriate carrying-out of soil sampling (p. 95-96).

The methodology acknowledges that **past sustainable agricultural practices** ("early action") cannot always be recognised via crediting due to additionality concerns (methodology, p. 9). Furthermore, fields that have been tilled to depths deeper than 20 cm in their historical baseline scenario are deemed ineligible to be credited for SOC gains resulting from shifting to no-till in order to avoid over-crediting (as a result of SOC migration from deeper layers) (methodology, p. 119).

The methodology defines the **crediting period** as 10 years which is renewable up to two times, so that the maximum total crediting period is 30 years. Projects or individual fields may end their crediting period earlier than 10 years though (methodology, p. 12). The methodology states that the crediting period begins at the project start date regardless of whether sufficient monitoring data is available to verify GHG emissions (p. 12). The project must pass the eligibility requirements as well as any updates to the additionality requirements before the crediting

period is renewed (methodology, p. 12). Additionally, at latest after five reporting periods, quantification methodologies, the additionality of projects and the determination of baselines must be verified (among other items that are subject to verification) (methodology, pp. 99ff).

1.2.5.3 Approaches for assessing additionality

To ensure additionality, CAR applies a standardised additionality test, setting out performance standards and other criteria which projects must meet in order to be considered additional (program manual, p. 6). The SEP methodology (like other CAR methodologies) implements this additionality test through a project type-specific performance standard test and a legal requirement test. As part of the **performance standard test**, additionality is demonstrated by the adoption of changes in agricultural management practices "that are reasonably expected (over the project crediting period) to increase SOC storage and/or reduce emissions of CO_2, CH_4, and/or N_2O from agricultural land management activities." Changes may be "simple" like the addition of cover crops, or more complex such as increasing the diversity of the species used for a cover crop. The magnitude of the practice change "must be such that a reasonable person, knowing the context of the baseline scenario in the relevant region, would consider it to be a new management practice" (methodology, p. 13.). The performance standard test also involves a **common practice additionality assessment**. As part of this assessment, a negative list of activities which are deemed to be non-additional by default is applied. For this purpose, CAR has an additionality tool in place which specifies which activity is considered additional in which county (depending on the uptake rate of the activity). In a second step, projects can demonstrate whether parts of the project identified as non-additional are deemed additional (methodology, p. 12ff).

Furthermore, all projects need to pass a **legal requirement test** to ensure that the mitigation achieved is not required by any other law or regulation. To pass this test, project owners must submit a signed "Attestation of Voluntary Implementation form"[66] before each verification and include approaches in the monitoring plan for ensuring and demonstrating that the project is additional to existing regulation (methodology, p. 19).

As part of the verification process, it is verified whether projects meet the performance standard test, have appropriately executed the Attestation of Voluntary Implementation, that no laws are in place that mandate the project activities, and that a mechanism is in place for ascertaining that the project passes the legal requirement test at all times (methodology, p. 100). The performance standard test to confirm additionality needs to be passed again if a project seeks to renew the crediting period. The methodology does not explicitly require existing policies or mitigation targets to be considered in the determination of baselines, but specifies that when an eligible practice becomes mandated by law, the baseline needs to be updated to reflect this legal change in order to issue further credits to the project (methodology, p. 12). New projects must be submitted to CAR no later than 24 months after the start of the cultivation cycle during which the eligible practice change was adopted (methodology, p. 11).

CAR's methodology allows for a project receiving other sources of funding via grants, subsidies, payments etc. as well as mitigation credits from other types of activities on the same land, except where such payments or credits are specifically delineated per t CO_2e. The methodology mentions the following as additional credit opportunities for soil enrichment projects that are not yet mature market opportunities: carbon sequestration tax credits, water quality trading programmes and non-GHG impact certifications. Potential additional sources of payment relate to conservation programmes aiming to prevent conversion of grazing and pastureland and

[66] Available at https://www.climateactionreserve.org/how/program-resources/documents/.

action-based enhancement payments providing financial assistance to landowners for implementing conservation practices. Any other source of funding or crediting must be disclosed to the Reserve which needs to give approval (methodology, pp. 19-20).

1.2.5.4 Approaches for addressing non-permanence

CAR requires credited reversible GHG reductions (see section 1.2.5.4) and removals to endure for a minimum period of 100 years. While carbon stored in a carbon pool such as SOC could be released into the atmosphere in the future and is therefore considered reversible, activities such as avoided N_2O emissions are not considered reversible (methodology, p. 20-21).

To meet CAR's requirements related to permanence, the following mechanisms are in place (methodology, p. 20ff; 37-38):

- **Monitoring, reporting and verification** of projects and potential reversals beyond the crediting period for 100 years. Monitoring reports must be submitted at least every five years (methodology, p. 90). During the permanence period (period after the end of crediting until 100 years have elapsed), specific sources of reversal risks must be monitored, including wholesale change of land use to an ineligible activity, physical disturbance of the soil through e.g. increased tillage or roads, unavoidable reversals and overgrazing. However, it is not specifically required to monitor whether sustainable management practices are maintained or to measure whether SOC stocks do not decrease (e.g. due to global warming effects). Grazing activities must be quantitatively and qualitatively accounted for where relevant and an administrative mechanism to prevent overgrazing must be in place. The verifier must assess whether the quantification of project emissions from grazing is conservative (p. 91-92).

- Signing a **Project Implementation Agreement (PIA)**[67] obligating project owners to supply credits to compensate for potential intentional reversals (including ceasing monitoring and verification activities or early termination of the project) for a defined period of time. To compensate for reversals, credits from other soil enrichment projects under the standard should be used but other credits are acceptable as well if these are not available (p. 46). If the PIA is concluded for less than 100 years, alternative mechanisms need to be used for the remaining time to ensure permanence for 100 years. As an alternative mechanism to compensate for reversals, project owners may use financial products such as a surety bond, upon approval of CAR. The use of such a mechanism reduces the required contribution to the buffer pool (methodology, p. 23). However, CAR does not have provisions in place for dealing with avoidable reversals in case the project owner is not able or willing to comply with their obligation to compensate for avoidable reversals.[68]

- Making contributions to the **programme's buffer pool,** which provides insurance against unintentional reversals. The contribution to the buffer pool is determined by a project-specific risk rating. The contribution to the buffer pool is higher for projects that are geographically more concentrated. It also accounts for a potential financial failure of the project owner (p. 42). The risk assessment is re-calculated for each reporting period (p. 43).

[67] https://www.climateactionreserve.org/wp-content/uploads/2022/04/Soil-Enrichment-Protocol-PIA-4.20.22.pdf

[68] The risk assessment that determines the contribution of a SEP project to the buffer pool includes a default risk relating to financial failure or mismanagement. This default risk is taken into account when determining the overall risk rating of a project and the corresponding contribution to the buffer pool. A project owner may reduce the default risk rating by using financial mechanisms like insurances or surety bonds (methodology, p. 42). The fact that the risk assessment takes a default of a project owner into account could be interpreted as an indication that the buffer pool might also be used to compensate for an avoidable reversal. However, an explicit provision that ensures that this could not be found in CAR's documents.

There is no provision for excluding projects with very high risk from eligibility under the methodology.

- Using **tonne-year accounting** in combination with or as an alternative to the aforementioned permanence mechanisms. Under this accounting approach, less credits are issued to a project in proportion to the amount of time for which the stored CO_2 is kept out of the atmosphere (less than 100 years), accounting for the fact that the stored carbon might be reversed thereafter (methodology, p. 20ff; 37-38).

The appropriate execution of the chosen mechanism(s), including the risk assessment is part of the verification process of a project (methodology, p. 100-102).

After the end of the required 100 year monitoring period, credits held in CAR's buffer pool stay within the reserve without retiring them (personal communication with CAR). If the programme ceased to exist, no explicit provisions are in place to ensure the continued operation of the reserve. CAR explained in personal communication, that the process for handling the Reserve's assets in the event of bankruptcy is part of its internal operating procedures.

Project developers are required to be able to identify the **land title holder** for any given field if requested by the verifier or the Reserve. Project developers are encouraged to make sure that land owners have been fully informed about and contractually agreed to the SEP project. However, land title holders are not required to have contractual relations with the project (methodology, p. 8).

No provisions on adjusting the baseline in case of a reversal are in place (presumably because baselines are applicable for a short time period only).

1.2.5.5 Approaches for avoiding double-counting

CAR seeks to avoid double counting in **defining the project boundary** (programme manual, p. 21). In the case of the SEP, the quantification of emission reductions is done on a field by field basis, guided by the cultivation cycle of the given field. Fields can only be registered to one project at a time (methodology, p. 89).

The "**ownership" related to the GHG reduction rights** are attested by the project owner's signature of the Reserve's Attestation of Title form (methodology, p. 8).[69] Upon submission of a project proposal and prior to registration, CAR staff conduct a **review of other registries** to ensure that the project is not seeking GHG credits under other programmes (programme manual, p. 21). Every time a project is verified, the project owner must confirm that no other entities are reporting or claiming the GHG reductions caused by the project (methodology, p. 8). The ownership of the reductions is reviewed as part of the verification (methodology, p. 100). Additionally, verifiers need to inquire whether there might be potential double-counting from issuance of credits under another protocol of activities that have overlap with the credited activities. They also need to verify that the project is not simultaneously receiving credits or payments for the same project activities (p. 100).

Additionally, **CAR has a well-functioning registry in place** that tags each carbon credit with a serial number, including information on the location of the project, the relevant protocol and the vintage of the credit. All information in the registry are made public, including issuances and retirements as well as cancellations for other programmes (programme manual, p. 21; serial number guide). The registry contains the following columns: project ID, project name, project developer, project owner, project site state, project country, total credits issued, credits held in

[69] Available at https://www.climateactionreserve.org/how/program-resources/documents/.

the reserve pool, credits intended for ARB buffer pool, credits converted to VCUs, credits cancelled for ARB compliance, credits cancelled, project website, documents (including links to further information on the project) (CAR registry).

The registry also includes **information on the reason for which a credit is retired** including the voluntary goal or requirement that is achieved through the retirement. However, providing information on the beneficiary or the calendar years for which these goals are achieved is not mandatory (programme manual, p. 21; Terms of Use, p. 13).

CAR **does not have rules in place yet to authorise credits so that they can be used towards achieving national NDCs** through a mechanism developed under Article 6 of the Paris Agreement but states that it is working towards implementing corresponding procedures in the future (programme manual, p. 42). CAR has established a label for earmarking credits as eligible under CORSIA though (CAR registry).

CAR has rules in place for ensuring that the project's impacts are **not double-counted with achieving mandatory domestic mitigation schemes.** The crediting period will be terminated if the affected emission sources are included under an emissions cap or if GHG emissions from the project are directly regulated by a local, state or federal agency (programme manual, p. 11).

1.2.5.6 Environmental and social safeguards

Project developers are required to **demonstrate that their projects will not undermine progress on other environmental issues** such as air and water quality, endangered species and natural resource protection as well as environmental justice (programme manual, p. 12). For that purpose, the focus lies on ensuring that any legal requirements are respected in implementing the project (p. 13).

The methodology includes guidance for ensuring that no laws are broken, including laws relating to broader non-GHG impacts of projects. Upon registration of a project, the project developer must confirm that the project was in **compliance with all applicable laws** by signing an "Attestation of Regulatory Compliance form"[70] (methodology, p. 9-10). If project activities have caused a material violation of relevant laws, no credits will be issued for the period where the violation occurred (programme manual, p. 12).

Beyond these legal requirements, projects are "**encouraged to identify, measure and report on any non-GHG benefits** of the project activities, such as alignment with the UN Sustainable Development Goals or other identified co-benefits" (programme manual, p. 2). Under the specific SEP methodology, project developers are "urged" (but not obliged) to describe any significant positive or negative impacts of their projects on other environmental issues including air and water quality, endangered species, natural resource protection and environmental justice. If potential negative impacts are identified, project developers are encouraged to describe the steps that have been or will be taken to mitigate and/or monitor them. Project developers should also **report on potential environmental co-benefits** of their projects, such as reduction of other pollutants, improvement in water quality, enhancement of wildlife habitat etc. However, there is no specific obligation to proof that projects do not counteract broader non-GHG goals (methodology, pp. 9-10; 25). The methodology states that "since eligible practices should constitute an overall improvement relative to historical management, it is unlikely that the project activity will result in significant negative non-GHG impacts" (p. 9).

Reporting on co-benefits is mandatory to the extent required in order to be eligible to supply offsets to CORSIA (methodology, p. 10). Projects that seek to be eligible under CORSIA must

[70] Available at https://www.climateactionreserve.org/how/program-resources/documents/.

report their alignment with the UN Sustainable Development Goals (SDGs) and co-benefits by using CAR's **SDG Reporting Tool**[71] (programme manual, p. 41). For other projects, monitoring social and environmental impacts is not mandatory though nor are specific co-benefits a general prerequisite for crediting of the project activity. An impact assessment beyond ensuring that no laws are broken is not required.

As part of the verification process, the description of how the project avoids negative environmental or social effects is reviewed (methodology, p. 100).

The methodology **does not have specific mechanisms in place for stakeholder consultations** in case of impacts on local communities. As a general grievance mechanism, stakeholders can contact the reserve via a general email address and phone number. Any grievance reported this way will be communicated to the senior management at the Reserve. The action to be taken will depend on the nature of the grievance, but the information provided remains vague. For grievances related to potential negative social or environmental impacts, the senior management "will conduct a finding of facts and consider the stakeholder's position. Such instances may be referred to the Board of Directors for a decision on project eligibility" (programme manual, p. 36). Such complaints submitted to the general programme level and their treatment are not subject to verification.

To avoid negative environmental and social impacts, at a more general level, **potential negative impacts and co-benefits are evaluated as part of the screening process** when developing new methodologies. Where deemed necessary, the development of additional safeguards is considered in this process (programme manual, p. 43).

CAR does not have a gender policy in place nor does it require a specific assessment of gender impacts of projects.

1.2.5.7 Governance questions

CAR's website lists their staff and their functions related to the administration of the programme. A **Board of Directors** comprising an Advisory Board and a Governing Board oversees CAR's work. Their role in approving each protocol is described in the programme manual (p. 45) and their names and affiliations are shown on the website. Minutes of meetings of the Board are not disclosed to the public.

Information in the registry as well as verification reports are disclosed to the public (programme manual, p. 21). CAR upholds a **transparent registry, comprising** comprehensive project information and links to further project documents. The documentation of the validation and verification processes is also made available through project websites that are accessible through the registry.

CAR has a **robust verification process** for each project in place that is outlined in the verification manual, the programme manual and the SEP methodology (pp. 93ff). The verification manual also includes provisions in case of non-conformance of a verifier with CAR's rules or procedures. The website provides information on the requirements on how to become a verifier.

CAR's programme manual describes the **process for developing and approving new methodologies**: First, an internal screening process is carried out to check whether a new project type is suited for developing a protocol, including a check of whether credible and accurate baseline emissions can be estimated and additionality can be ensured. If the project type has been found to have a good potential for protocol development, in a second step, an

[71] Available at http://www.climateactionreserve.org/how/program/documents/.

issue paper evaluating the feasibility and desirability of developing a protocol is developed or a scoping meeting with stakeholders is organised. In a third step, a multi-stakeholder working group is formed to provide expert review and input during the protocol development. Once a draft protocol has been developed and input from the working group has been incorporated, the draft is published for public review. When public comments and any further feedback from the working group have been incorporated, the protocol is approved by CAR's Board of Directors. Thereafter, the public can submit feedback and comments on an ongoing basis. Protocols are periodically revised on the basis of public comments, practical experience and technological, scientific and regulatory developments (programme manual, pp. 43ff). Yet, there is no publicly accessible description of the process of making amendments to the programme manual itself.

Normative programme documents including the programme manual, the verification programme manual, the Terms of Use, and CAR's User Guide are publicly available on the website.[72] The programme manual refers to the principles and requirements of international standards that guide CAR's offset protocols (ISO 13064 and WR/WBCSD GHG Protocol for Project Accounting) (p. 26).

CAR has a **non-public code of conduct** in place which employees of the programme need to sign. There are no conflict of interest provisions for board members publicly available. Conflict of interest evaluations are only required in the selection of verification bodies.

A general option to submit grievances to a stated email address or phone number is provided in the programme manual (p. 36), but no explicit appeals process is available (see previous section). No further information on any submitted grievances and their consequences is available.

1.2.6 Nori Pilot Croplands Methodology v 1.3

Nori is a private-for-profit, USA-based company providing a market for carbon removals. In its pilot phase, it is focussed on carbon removals through croplands soil sequestration. Established in 2017, it developed its first methodology, for sequestering soil carbon on croplands, in 2019. In the current pilot phase, farmers are paid cash in return for removals, however, in the future they will be paid in tradeable crypto tokens (NORI tokens, each equivalent to 1 t CO_2e removed from the atmosphere for 10 years), which will be traded on the Nori market (Nori website, /token). Currently, Nori has only one methodology, for soil carbon sequestration on croplands, but plans to open their market to other types of removals in the future (Nori website).

Key methodology documents

- **Nori website**, compiling all documents relevant for the Nori methodology[73] (programme-specific, referred to as the "Nori website");
- **Nori pilot croplands methodology** v1.3 (15.12.2021), the key methodology document describing how carbon removal calculation methodology and creation of Nori credits[74] (method-specific, referred to as "Methodology")

[72] https://www.climateactionreserve.org/how/program-resources/documents/

[73] https://nori.com/

[74] https://storage.googleapis.m/nori-prod-cms-uploads/Nori_Croplands_Methodology_1_3_a9a8e9e99c/Nori_Croplands_Methodology_1_3_a9a8e9e99c.pdf

- **How Nori Works**, an overview document that describes overarching operation and principles behind Nori (programme-wide, referred to as "How Nori Works"[75]
- **Nori Carbon Removal Tonne Agreement**, template for contractual agreement between Nori and project proponent for supplying removals in return for Nori credits (programme wide, "NRT Agreement)[76]A Warranty for Carbon Removal, a blogpost describing how the Nori insurance works (programme wide, referred to as "Warranty blogpost")[77]
- **John Nergenah project page**, a project description example focussed on John Nergenah's farm (referred to as "example")[78]

1.2.6.1 General description

Nori's methodology rewards farmers for implementing cropland management changes that lead to increased soil carbon stocks, relative to their current management (emissions reductions are not rewarded). It does not consider other gases or emissions. Soil carbon stocks are modelled using a farm carbon audit tool (Soil Metrics GGIT[79]). Any actions that remove additional carbon from the atmosphere that are captured by the tool can be implemented and rewarded, including e.g. crop rotations, cover crops, reduced tillage, residue management, fertiliser management (Methodology, p.12). Farmers can opt in whole farms, subsets of fields, or in groups of fields/farms (Methodology, p.15). Farmers are committed to maintaining soil carbon stocks for at least the ten year crediting period (In the pilot phase, farmers can be "grandfathered" credits, i.e. paid for up to four years of past carbon removals (Methodology, p.16). Credits are issued ex post, after verification of carbon removals by a third party verifier.

Nori removals are sold as offsets. 125,000 credits (Nori Carbon Removal Tonnes, NRTs) have been sold, generated across 18 projects, each credit represents 1 tonne of carbon dioxide removed from the atmosphere and stored in the soil for at least 10 years (Nori website). The 18 projects are different sizes and types. For example, one removals supplier is a 3000 cow dairy farm with 5200 acres of perennial forage and grain crop land, which has implemented minimum and no till fertiliser management, perennial forage crops to remove 6591 t CO_2e over the ten year project lifetime (an average of 0.127 t CO_2e/ha/yr), 5124 t of which have been sold (Nori website[80]); a second example is a corn, soybean, and rye farmer who has implemented no-till, cover cropping, and cattle grazing of corn stubble (Nori website, /supplier/5). Prices are 20 USD per tonne removal, which farmers receive, plus a 15% service fee (Nori website, /remove-carbon). A third example project is John Nergenah's farm, in Illinois, USA (example). He has registered 13 areas of his farm on Nori and implemented no-till and cover cropping, which has allowed him to reduce synthetic fertiliser use. He has generated and sold Nori credits equivalent to 1255 t CO_2e.

[75] Available at https://nori.com/resources/how-nori-works

[76] https://storage.googleapis.com/nori-prod-cms-uploads/NRT_Agreement_2022_Pilot_and_Token_Payment_docx_c29c26e0d4/NRT_Agreement_2022_Pilot_and_Token_Payment_docx_c29c26e0d4.pdf

[77] https://nori.com/blog/insurance-for-carbon-removal-offsets

[78] https://nori.com/supplier/5

[79] https://soilmetrics.eco/technology/

[80] https://nori.com/supplier/U3VwcGxpZXJQcm9maWxlOlVzZXIsNjAzOTgxNDY5MzQ1MzgyNCxTdXBwbGllclByb2ZpbGUsNjAxNTYzOTU0NzI4MTQwOA== , accessed 14.08.2023

1.2.6.2 Approaches for quantifying emission reductions or removals

The Nori Pilot Croplands Methodology calculates all soil carbon stock changes using modelling; no soil samples are required. They use an external quantification service, provided by Soil Metrics, who apply their Greenhouse Gas Implementation Tool model (GGIT) to farmer-provided data to generate forward-looking estimates of baseline carbon stocks and increased carbon stocks due to management changes (Methodology, p.5). Nori deems the Soil Metrics quantification tool as equivalent to IPCC Tier 3 and report that it applies conservative assumptions (Methodology, p.6). Quantification is based upon farmer-provided data, including crop rotations, crop seeding dates; liming, fertiliser and nutrient applications; irrigation practices and water use; crop yields and uses; crop residues left on their fields; residue management and removal techniques and tillage practices; as well as weather and soil data (Methodology, p.8). However, if farmers are unable to provide sufficient historical data, Nori proxies local data from US Department of Agriculture (USDA) databases assuming best practice management (Methodology, p.8). Quantification considers only soil organic carbon stocks (i.e. net carbon dioxide removals and its storage); other gases and indirect up- and downstream GHG emissions are not considered (e.g. other soil carbon storage) (Methodology, p.15).

Project boundaries are determined by the farmer, who can choose to include all or a subset of their fields (Methodology, p.15). Quantification is carried out separately on each field; if any fields end up not sequestering carbon (i.e. soil carbon stocks decrease), the farmer can choose to ex post exclude the field from their project (Methodology, p. 25).

Quantification occurs at project start and at the end of the ten-year crediting period, as well as at least three points during credit period (Methodology, p.20). The final audit process for the end of the ten-year project period is still being developed; it is unclear if projects will be able to be renewed or under what terms (Methodology, p.27). Farmers must provide all data sufficient to estimate soil carbon over an online project information page. The initial verification (at project begin) is carried out remotely based on provided data including project location, ownership, and historical management data, as well as planned future management changes (including e.g. cropping and planting plans, tillage plans, fertiliser and manure usage, etc.) (Methodology, p.17). Farmers are not held to these plans as crediting is ex post; later verification rounds require farmers to provide data on their actual historical management (as well as updated future plans) (Methodology, p. 20). Nori only quantifies difference in soil carbon stocks; it makes no adjustments for positive (or negative) other GHG fluxes or CO_2 emissions.

Nori promises buyers that removals are accurate to +/-10%, however, it is unclear how this is achieved or how this translates to NRT calculation (How Nori Works, p. 36)**.** In particular, it is unclear if model uncertainty in Nori is monitored or controlled for. Nori uses an external quantification service, Soil Metrics, who provide limited information on exactly how they quantify soil sequestration or its uncertainty, instead referring to an external US Department of Agriculture paper, stating only that their tool "uses a combination of dynamic and empirical models to estimate the known greenhouse gas source categories from cropland and grassland systems, following guidelines outlined by Eve et al. 2014" (Soil Metrics website). The report they refer to explicitly states that "Given the lack of uncertainty information for most of the relevant external models, it is not currently feasible for the GHG quantification methods to quantify this source of uncertainty" (U.S. Department of Agriculture 2014). **Nori calculates a forward-looking baseline based upon at least three years of historical data (Methodology, p.8).** Farmers are required to provide data on farm management practices and farm information, which are then used to create a forward-looking 10-year baseline that estimates soil carbon stock change if that management had continued (Methodology, p.7). Where farmers lack sufficient data, Nori uses proxy historical data from USDA databases (e.g. state-level

planting and harvest dates, tillage methods, rate and type of fertiliser, among others) (Methodology, p.22). The baseline is estimated using expected weather; each time that credits are quantified, the baseline is updated to reflect actual weather that occurred (Methodology, p. 7). The baseline is only updated over time for differences between expected and actual weather; baselines do not consider policy or statutory requirements (Methodology, p.7). If reversals occur, i.e. the soil carbon stock decreases on a field, this does not affect the baseline but farmers will not receive credits for that field until soil carbon stocks increase above the baseline (Methodology, p.23).

Nori assumes that leakage is not a significant risk and does not control for it (Methodology, p.5)**.** Nori gathers some data to monitor leakage in the form of other gases, e.g. nitrous oxide from fertiliser, urea, biomass burning etc., but these are not systematically monitored or reported (Methodology, p.21). Nori reports that if evidence suggests that leakage may be occurring, they will adjust the methodology (Methodology, p15).

On the website, Nori states that one Nori Carbon Removal Tonne (NRT) represents "approximately one tonne of removed CO_2 stored for a minimum of ten years".

1.2.6.3 Approaches for assessing additionality

Additionality is determined exclusively in relation to the baseline – the only other additionality requirement is that farmers implement a "discrete activity or practice change" that is expected to mitigate climate change (Methodology, p.13). Baselines are re-evaluated over the ten-year project duration to account for weather and climate impacts but are not otherwise adjusted (e.g. the baseline does not consider changes in policy or regulations, Methodology p.7). There are no other additionality requirements or assessments: for example, **no financial additionality or regulatory additionality** test or requirement. All increases in soil carbon beyond the baseline are assumed to be additional, as long as they occur after the implementation of the "discrete activity or practice", which is referred to as the project switch date (Methodology, p.13).

Nori rewards farmers for historical action: during the Nori pilot phase, Nori will reward up to four years-worth of historical mitigation (i.e. "grandfather")(Methodology, p.16). Farmers must be able to provide at least three years of data prior to the switch date but there are no other requirements. Nori argues that this grandfathering is appropriate during the setup phase of Nori due to the additional contributions first-mover farmers make (though do not discuss the questions of additionality for these credits) (Methodology, p. 16).

1.2.6.4 Approaches for addressing non-permanence

Nori makes no promises regarding permanence; committing only that one Nori removal credit is equivalent to one tonne of carbon removal stored for at least 10 years, though it is unclear how this will be ensured (How Nori Works, p. 15)**.** This 10-year period runs from the date that the credit is verified and made available for sale. However, it is as yet unclear if or how permanence will be enforced beyond the 10 year project period (i.e. for credits sold in the last year of the project period): the method for the final audit (which would assess the project and its plans for ensuring at least 10-years storage for each sold credit) is yet to be defined (Methodology, p. 20).

A blog post outlines that the ten-year period will be guaranteed in two ways. Firstly, through restricted Nori credits (i.e. a percentage of expected removals credits that are held back from the farmer in a buffer by Nori and only transferred to the farmer over and at the end of the 10-year project duration). Nori calls these "uncertainty deductions," though they refer specifically to non-permanence risk (How Nori Works, p. 35). These aim to manage the risk that removals

verified early in the crediting period are reversed during the crediting period (i.e. non-permanence risk during the ten-year project duration). Nori calculates a "score" for each project at initial verification, with the score deciding how many removals credits are partitioned into a restricted account, which cannot be sold until verified at the end of the ten-year crediting period (How Nori Works, p.36). Credits put in the restricted account to cover non-permanence risk will be released upon provision of data verifying ten-years of storage (How Nori Works, p.37). It is not clear how this score is calculated or how this implemented.

Secondly, the 10-year duration should be ensured through a "Nori insurance reserve", which is a reserve of 100 million Nori crypto tokens, which Nori would use to purchase equivalent additional removals from suppliers, to cover any reversals (Warranty). This "insurance reserve" does not consist of actual removals but instead is rather a store of Nori's own Nori coins; should the value of the Nori coin decrease, the value of this insurance reserve would also fall, feasibly to the extent that it would not be able to fund future removals to replace any reversals that occur.

Farmers are contractually obliged to provide data and maintain carbon storage for ten years, however, penalties for non-compliance are unclear and there are no permanence protections in the case of force majeure (NRT Agreement, p. 4). Farmers must use "their best efforts" to maintain carbon for the ten year storage period. Should they fail to do so, Nori can "have the ability to cure non-compliance" at the farmer's expense. Costs for this can be covered by using a farmer's restricted tokens (bonus carbon removal tokens awarded to farmers who participate in the start-up phase of the market), though these do not appear to be backed by removals and are merely a financial asset. Farmers are not liable in the case of force majeure, so long as they made "commercially reasonable efforts" to retain carbon (NRT Agreement, p.4); the aforementioned blog post (Warranty) claims that Nori would cover force majeure reversals by purchasing additional removals but this is not set out in other standard documents.

Farmers are not required to have legal title to land to join and begin receiving credits (though they can only receive up to three-years' worth of credits without legal title) (Methodology, p. 11). There are no contingencies regarding change of land ownership or management, or insolvency.

1.2.6.5 Approaches for avoiding double-counting

Credits are designed to be used for offsetting through a voluntary carbon market. There are some controls to avoid double-counting. Farmers must not sell the carbon removals covered by the Nori project elsewhere (unless they retire the removals from the Nori marketplace) (NRT Agreement, p. 3). This is to be checked by the verifier at the time of verification, who can accept a signed attestation from the farmer (Methodology, p. 27). There are no checks as to whether the climate mitigation activities were funded by a non-market policy incentive (e.g. regulatory requirement or subsidy). Nori gives farmers an explicit right to sell other services generated by the action (e.g. emissions reductions, water retention) (NRT Agreement, p. 3).

All Nori credits will be recorded in a publicly available registry, backed by a blockchain entry, which is yet to be launched (How Nori Works, p. 21)**.** In the registry (and blockchain entry), each carbon removal credit (an NRT) lists descriptive information on the removal, including project name, origin location, the verifier's name and location, year, methodology, and some buyer information (name, location), price, transaction date and time. There is no documentation of what credits are used for, including no mention of links to NDCs or international trading of credits.

1.2.6.6 Environmental and social safeguards

Nori has very few environmental and social safeguards. Nori recognises and rewards any actions that lead to increased carbon storage, as long as they are calculable using the quantification tool, i.e. there are no eligibility requirements linked to environmental/social impacts. . There is no discussion of biodiversity impacts and only passing mention of soil health in the methodology documents.

There is the potential for some incidental monitoring of environmental co-benefits but these are not collected or separately monitored (Methodology, p. 21)**.** The data gathered to calculate removals in the quantification tool can also be used to calculate co-benefits, e.g. nitrous oxide emissions, woody biomass, carbon dioxide emissions from fertiliser use, etc. However, these are not monitored under the Nori methodology, either at individual or standard level.

Nori does have an explicit policy related to ownership and rights to soil (Methodology, p.11)**.** They differentiate between suppliers (i.e. farmers) where all parties with an interest in the land have assigned authority to the primary contact, who contracts with Nori; in this simple case, the primary contact has full rights to contract with Nori and the methodology applies with no additional restrictions. Alternatively, suppliers (i.e. farmers) who do not have ownership rights over the land can contract with Nori and receive up to three years' worth of credits but must get full authority from all interested parties to receive any further credits (i.e. the additional seven years of credits up to the ten year project period duration).

Nori has no stakeholder consultation or grievance mechanism, no gender policy, and no benefit sharing systems.

1.2.6.7 Governance questions

Nori is a privately owned, for-profit company. A start-up, it has received seed investment in two public funding rounds; in the most recent 2020 round, it received $4 million in funding from venture capital firms with a crypto-currency focus (North Island Ventures and Placeholder) and agri-innovation focus (Tenacious ventures).[81] Nori employs twelves staff; in addition, Nori lists seven external advisors (Nori website, /about); there responsibilities and affiliations are listed on their website.

Nori develops its own methodologies (How Nori Works, p. 9)**.** So far, they have created only one methodology (that reviewed here). This was developed in accordance with ISO 14080:2018. Methodology development was reportedly supported by an independent Peer Review Committee, who are expected to provide input on methods, assess new quantification techniques, verification approaches, hear appeals from market participants, and share knowledge and information with other stakeholders (How Nori Works, p. 11). Peer review members are expected to be independent with no direct interest in Nori's marketplace, alongside Nori observers (How Nori Works, p. 11). Nori welcomes public comment but has no specific public commenting round; rather all comments or feedback are reviewed and responses published in an annual response to comments (How Nori Works, p. 10)

Verification is carried out by two independent bodies. Farmers have to provide annual data reports and submit to verification at least once every three years. Verification consists of two steps: all data is provided to an external quantification service, who calculate removals based upon the data (see quantification section). Independently of the quantification, a third-party verifier assesses simply whether the data provided by the farmer is complete and whether it appears trustworthy (Methodology, p. 18). The verification report is provided to the farmer, if

[81] https://www.coindesk.com/business/2020/09/24/climate-startup-nori-raises-4m-to-solve-carbon-market-double-spending/

any data adjustments are requested, these must be fulfilled by the farmer before verification. Nori uses independent verifiers, who must be ISO 14065 accredited; Nori automatically accepts approved verifiers for Climate Action Reserve, American Carbon Registry, and Verra (How Nori Works, p. 38).

Methodology documents are publicly available (Nori website, /documents). The Nori Registry was launched in May 2023 (Nori website, /registry). It provides an anonymised overview of recent trades. It also provides a link to a brief overview of each Nori project, which includes a paragraph project description, and high-level list of implemented practices (e.g. Continuous no-till, utilising cover crop mixes, planting green, applying compost and manure) and timeline (e.g. Eliminated all tillage by 2016, phased in cover crops on 100% of fields in 2015-2016, detailed digital management records since 2010), as well as project owner name and images of field parcels. It also provides links to verification reports, which are very high level: they provide a one paragraph summary and attest that provided data accords with Nori requirements. No information is available on a complaints process.

1.2.7 Interreg North-West Europe (NWE): Care-Peat

Care-Peat is a project aiming at reducing carbon emissions and enhance carbon removals by different types of peatlands in North-West Europe through peatland rewetting. It is implemented by a partnership of seven knowledge institutions and five nature institutions from Belgium, France, Ireland, the Netherlands and the United Kingdom. Care-Peat started in 2019 and sets the goal to reduce 8,137 tonnes CO_2 emissions at the end of the project in 2023 (website).

Key methodology documents

- **Care-Peat website** describing the project[82] (referred to as "website");
- **Method for determining CO_2 equivalent emissions reductions**[83] (referred to as "methodology");
- **White paper** (2021): Towards a carbon credit & blue credit scheme for peatlands[84] (referred to as "white paper");
- **Leaflet**: Interreg North-West Europe describing the programme[85] (referred to as "leaflet");
- **Case study**: Netherlands first carbon credit sale from peatland rewetting[86] (website, referred to as "case study");
- **Rules on Policy additionality** (v. 2.0, January 2020) by the Dutch National Carbon Market Foundation (*Stichting Nationale Koolstofmarkt*)[87] (referred to as "additionality rules").

[82] https://www.nweurope.eu/projects/project-search/care-peat-carbon-loss-reduction-from-peatlands-an-integrated-approach/#tab-1

[83] https://nationaleco2markt.nl/wp-content/uploads/2020/06/AAA_GDNK-Groen-Veenweide-002-1-english_def_def.pdf

[84] https://www.nweurope.eu/media/16118/carbon-credit-and-blue-credit_whitepaper_v21-final-niallob-with-cover-1.pdf

[85] https://www.nweurope.eu/programme-2014-2020/what-is-interreg-nwe/

[86] https://www.nweurope.eu/projects/project-search/care-peat-carbon-loss-reduction-from-peatlands-an-integrated-approach/news/netherlands-first-carbon-credit-sale-from-peatland-rewetting/

[87] https://nationaleco2markt.nl/wp-content/uploads/2019/12/Beleidsadditionaliteit-2.0.pdf

1.2.7.1 General description

Care-Peat implements peatland restoration on pilot sites (between 1 and 250 hectares) by using innovative technologies for peatland restoration and carbon measurement (website). Rewetting of peatland on these sites involves raising groundwater levels and transformation from unsustainable drainage-based agriculture to sustainable wet-farming (e.g. paludiculture) or ecological restoration of non-productive peatlands (white paper, p. 5). Projects can involve single or a group of landowners (methodology, p. 5).

Overall, the regulations for Care-Peat seem to be a work in progress and the documents available remain vague on many aspects. Care-Peat refers to a methodology for determining emission reductions through increase in groundwater levels in peatland areas (Paying for Peat) that has already been applied in a peatland restoration project in the Netherlands under the Dutch Green Deal National Carbon Market[88] (methodology). It is stated that this has been the first time that this type of project has been applied in the Netherlands (methodology, p. 5). This methodology is assessed in the following section. However, no clear statement is made whether this methodology should be used for quantifying emission reductions under a more comprehensive crediting scheme in North-West Europe that remains to be developed. In 2021, as part of the so-called 'capitalisation project', **Care-Peat started to develop a unified methodology for assessing GHG emissions from peatlands that is widely applicable in North-West Europe for different peatland types and regions (website). Such a methodology does not seem to be available yet though.** In its methodology, Care-Peat uses the terms "avoided" and "reduced" emissions interchangeably for its activities.

As part of the project, a white paper was developed outlining the requirements and steps needed to establish certification frameworks across Europe to support and incentivise the restoration of peatlands. It outlines ideas what a crediting scheme for peatlands in North-West Europe could look like but does not provide a regulatory statute (white paper). This paper states that emission reductions and CO_2 removals should be included in a carbon credit scheme (white paper, p. 21). It envisages to develop a framework for crediting at national or regional level (p. 35). However, the paper concludes that a carbon credit system on its own is not suitable to support sustainable peatland management and restoration. Instead, a methodology to account for other ecosystem services should be developed in order to generate so-called "eco-credits" obtained from peatland restoration (p. 36). The paper suggests that such credits will eventually be usable for offsetting, however this is not fully clear yet.

However, there is currently no regulatory framework under Care-Peat in place to guide the process of monitoring and verifying emissions, issuing credits and tracking their sale. The programme should therefore be treated as work in progress.

Care-Peat is coordinated by the "Interreg North-West Europe" programme which is part of the European Cohesion Policy and financed by the European Regional Development Fund. The programme aims to improve the innovation capacity and competitiveness of enterprises from North-West Europe, supporting the shift towards a low carbon economy and promote resource and materials efficiency (leaflet).

Although a common quantification methodology is still under development (as of November 2022), first credits from peatland rewetting were sold in the Netherlands in 2020 for emission reductions achieved in 2019-2020 at a target price of 70€ per tonne to private companies. Reduced emissions underlying these credits were quantified based on "standard calculations by Radboud University in Nijmegen, controlled national measurements and testing by the

[88] https://nationaleco2markt.nl/

Groningen climate knowledge center Joint Implementation Network (JIN) Climate & Sustainability". These calculations estimate that a total amount of 4,370 tonnes of emission reductions over a time period of 10 years can be achieved in 'De Lytse Deelen' in the Netherlands where the rewetting is implemented (case study).

The methodology refers to a system with "partial ex-ante certification" under clear conditions with regard to periodic monitoring and a reserve buffer with withheld certificates. 85% of the estimated emission reduction for a five-year period is issued at the beginning of this period and 15% are withheld in the buffer until the end of the five-year period (methodology, p. 16).

The methodology takes into account CO_2, CH_4 and N_2O emissions as well as above and belowground biomass, depending on the specific rewetting activity (methodology).

1.2.7.2 Approaches for quantifying emission reductions or removals

This section evaluates the document "**Method for determining CO_2 equivalent emissions reductions**"[89] which has been applied in a peatland restoration project in the Netherlands. It is not clear whether this methodology has been used or will be used in the Care-Peat project as well.

The methodology sets some **general requirements for eligible projects** that aim to rewet peatlands (project type "Paying for Peat"). The methodology applies to peat meadow areas with a peat layer that is at least as thick as the groundwater level prior to the water level increase. If a project involves several landowners they jointly agree on how much the water level will be increased compared to the baseline (methodology, p. 5). The project boundary is defined as the area where the water level is raised (methodology, p. 11). The project type can be implemented by **three different types of activities**:

1. Increasing the water level in the peat meadow area while continuing agricultural activities for growing grass (agricultural extensification). Plots with underwater drainage and pressure drainage are excluded from this project type.
2. Raising the water level while growing crops in wet cultivation (paludiculture).
3. Raising the water level to such an extent that nature benefits optimally without continuing agricultural activities (p. 5).

Baselines are established on the basis of average water level of drainage ditches on a province level in the Netherlands. If the water level in an area is on average higher than what is required by law, than the actual average water level will determine the baseline. This average water level is determined by measuring the water level at a comparable neighbouring plot or determining the average ground and water level of drainage ditches before the intervention takes place on the basis of previous management data. Baselines are fixed for 10 years and not adjusted during this period. For the cultivation of wet crops, the same baseline applies as for agricultural use as peat pasturage (methodology, pp. 12-13). For crops that store additional carbon in the soil by leaving behind root residues, the methodology vaguely states that this amount "should be compared to the number of kilogrammes of dry matter normally captured in a grassland mat which becomes part of the baseline. If a nature reserve is eligible for national subsidies, the required water level for receiving the subsidy determines the baseline (p. 14).

The **calculation for determining emission reductions or removals takes into account CO_2, CH_4 and N_2O. Emissions are determined annually on the basis of the relationship between CO_2e emissions and average groundwater levels.** The methodology refers to a publication by

[89] https://nationaleco2markt.nl/wp-content/uploads/2020/06/AAA_GDNK-Groen-Veenweide-002-1-english_def_def.pdf

Fritz et al. (2017) for this purpose. In this publication, emissions are calculated conservatively on the basis of assuming more extensive use of peatland soils. To calculate CH_4 and N_2O emissions, the methodology refers to average annual emission values per average groundwater level that are derived from Jurasinski (2016). It is assumed that no N_2O emissions occur if no fertilisation takes place (on areas used for nature development without agricultural use of the soil) (methodology, pp. 11-14).

For wet crops (activity 2 above), CH_4 and N_2O emissions are taken into account. Fixed emissions at ground level are provided in the methodology which must be "corrected" on the basis of Jurasinski (2016). The methodology defines a standard practice that should be used for the cultivation of wet crops to reduce methane emissions to some extent (periodically dropping the water level during the growing season) (methodology, p. 15). For nature development activities (activity 3 in the list above), CH_4 emissions must be taken into account. If the existing turf is flooded, additional CH_4 emissions can occur. This can be avoided by cutting the turf. While the methodology states that there is no reliable data available on the extent to which cutting the turf avoids CH_4 emissions, it is said that there is no need to correct for CH_4 emissions if the top 30 centimetres are excavated when cutting the turf. CO_2 emissions resulting from turf that is cut and oxidises must be included in the calculation of emissions (methodology, p. 15). However, precise guidance is lacking.

Indirect effects resulting from the supply of cattle feed from elsewhere need to be included in the calculation (0.4 tonnes CO_2e/ha) (with the exception of organic farmers). **Leakage effects due to an increase of livestock elsewhere are not taken into account** as "emissions from dairy cows will not change nationally". Further effects on GHG emissions by a changing number of cows are not deemed to be relevant and are therefore not considered though. **An increase of agricultural production elsewhere in the Netherlands on peat soils** is accounted for by discounting CO_2 emission reductions by 10%. Conversion of peat meadow areas to agricultural use resulting from project activities are not taken into account. An increase of agricultural production in other countries is not accounted for. More generally it is stated that only those effects that the landowner can influence himself are accounted for (methodology, pp. 11; 15).

To **calculate emission reductions** as a result of rewetting while retaining the agricultural meadow function (activity type 1), emissions from the project scenario are subtracted from baseline emissions while adding 0.4 tonnes CO2e/ha to account for indirect effects and subtract a 10% risk adjustment to address leakage effects. For growing of wet crops (activity type 2), the same calculation applies with the potential additional carbon sequestration through cultivating a specific crop type accounted for as well. Aboveground biomass is not included in the calculation (methodology, p. 16). For areas with nature development (activity type 3), the calculation needs to be adjusted for CH_4 emissions if the water level rises above ground level. No risk reduction is applied. Additional carbon stored in peat, swamp or vegetation can be accounted for if stored for a long time (not further specified).

In terms of **monitoring and measuring requirements**, the methodology includes the following instructions: The groundwater level needs to be continuously measured and determines the quantity of CO_2 released for rewetted areas (methodology, p. 15). To do so, a monitoring well is placed in the middle of a plot for activities of type 1. Processing the data needs to be done by an independent, specialised organisation. Alternative measuring methods are allowed if approved. The groundwater level is measured one year before the activity is implemented or it is carried out in a comparable, representative neighbouring plot. For growing wet crops (activity type 2), a monitoring well can be used if the water level is below ground level. If the water level is above ground level, it can be ready visually. To determine sequestration by root residues, samples of

these residues should be taken to determine the dry matter content or a fixed value on the basis of existing research can be taken (p. 21). For nature development activities (type 3), the carbon stored in vegetable material that remains in the area is determined by a "substantiated estimate". The methodology states that for water levels above ground level, a visual inspection of the water level and the determination of the captured carbon in plant material remaining in the area will suffice for determining the amount of emission reductions (p. 22). All monitoring results and the calculations need to be verified (p. 22), but no requirements for verification bodies are available.

The white paper published by Care-Peat mentions the principle of **conservatively estimating reduced GHG emissions** (white paper, p. 35). The paper also generally states that a crediting scheme **should take into account past sustainable management practices** in order to avoid perverse incentives for landowners (p. 21). However, no specific rules on this question are laid down.

The **project duration** which is assumed to equal the **crediting period** is defined as 10 years for peatland projects and 50 years for those areas that are used for "nature development", i.e. where no agricultural activity takes place (methodology, p. 14). The White Paper specifies that offsets are measured in tonnes of CO_2-e.

No information is available on how a quantification methodology will eventually be adopted.

1.2.7.3 Approaches for assessing additionality

According to the methodology, Paying for Peat activities are considered additional as long as the activities on peatland areas are **not legally required**. If reducing CO_2 emissions from peatlands becomes mandatory, the methodology can respond to this by raising the groundwater level to a higher level than what is required by policy (methodology, p. 11).

Furthermore, there is **no general practice** in the Netherlands to rewet peatlands. The revenue from the Paying for Peat programme makes these activities financially attractive for landowners as water level increases generally imply a loss of income (methodology, p. 11).

The methodology refers to a paper outlining the rules on additionality that are applicable under the Dutch National Carbon Market Foundation.[90] This document specifies requirements for additionality, including regulatory additionality and common practice benchmarks as well as rules for assessing these upon submission of a project plan (additionality rules). Additionality is then determined for 10 years (methodology, p. 13), and this assessment will not be changed if new policies are adopted in the meantime (also due to the possibility of issuing ex-ante credits under the rules of the Market Foundation). These rules also specify that buyers on the voluntary carbon market cannot use credits to meet legally required measures that apply to these buyers, but only make a voluntary contribution to climate mitigation, including by claiming to offset their emissions along the value chain (additionality rules, pp. 1; 5-6). However, it is not clear whether these requirements apply under the Care-Peat project.

Regarding **revenues from other sources**, revenues under Paying for Peat can be combined with agricultural nature management subsidies under the CAP if the soil is made wetter than necessary for an agricultural nature objective. If a management subsidy is already provided for nature conservation objectives, the water level specified for this subsidy will be applicable as the project baseline (methodology, p. 11). The additionality rules of the Dutch National Carbon Market Foundation state that financial additionality should not be assessed on a project-by-project basis (additionality rules, p. 3). Going beyond requirements set by the methodology, the

[90] https://nationaleco2markt.nl/

white paper lists additional sources of funding besides revenues from carbon credits that should form blended economic models providing income to farmers. On the one hand, it is stated that the question of additionality must be taken into account while on the other hand the paper says that additionality could be set aside for existing peatlands that satisfy high standard baseline criteria in order to reward long-term existing good practice. As an alternative, additionality could not include subsidies for other ecosystem services (white paper, p. 30-31).

1.2.7.4 Approaches for addressing non-permanence

Information on how to address non-permanence under Care-Peat is very limited. **No information is available on liability beyond the project duration** which is assumed to be the crediting period.

No information is available on how to compensate for reversals, i.e. emissions that are reduced for a certain period of time but released at a later point in time, that might occur. Only for ex ante credits, a portion of 15% is withheld in a buffer reserve and only paid out after a period of 5 years, but beyond, no methodologies seem to be in place (yet). No information on the use of risk assessments is available. No information on the need to hold legal titles, requirements for changes of landowners or what would happen in case of bankruptcy of the landowner or dissolution of the programme is available.

To issue credits ex ante, a contractual agreement with a farmer is required. The risk that farmers might implement activities that increase emissions are addressed by monitoring (methodology, p. 23), but this is only done throughout the project duration (which is assumed to be the crediting period). If it is not clear from statutes or other documents that farmers or nature management organisations have no reason to change the management of a peatland area again, the methodology states that this intention can be recorded by a notarial document (p. 14; 17).

1.2.7.5 Approaches for avoiding double-counting

No information on approaches to avoid double-counting under Care-Peat are available. The documents that are published on the website suggest that credits from rewetting activities should be usable on the voluntary carbon market.

1.2.7.6 Environmental and social impacts

Peatlands provide many ecosystem services beyond storing carbon, including the regulation and maintenance of water quality or quantity, flow attenuation, replenishment of groundwater, evaporative cooling, socio economic benefits and promoting biodiversity (white paper, p. 5).

No information is available on how social and environmental impacts shall be monitored, assessed or accounted for under Care-Peat.

1.2.7.7 Governance questions

Care-Peat is an Interreg North-West Europe project aiming to restore peatlands of seven different pilot site and developing and testing new equipment, methods and models to predict carbon flows in peatlands. As part of the project, a unified methodology for assessing GHG emissions from peatlands is developed. However, there is no single organisation with specific governance arrangements administering the project. Also, no information is available on the governance arrangements of a crediting mechanism that might be developed in the future from the project for restoring peatlands in North-West Europe. No requirements related to verification bodies is available on the website. A registry does not exist (yet).

1.2.8 Alberta Offset programme: Quantification protocol for conservation cropping, v. 1.0

The Canadian province of Alberta became the first jurisdiction to implement agricultural offsets in 2007 (Goddard 2021). Alberta's offset market legislation requires emission offsets to be quantified using government-approved methodologies, called quantification protocols (Sellars et al. 2022; Government of Alberta n.d.). The protocol was developed to provide best management practices for project developers and farm operators to reduce (or remove) on-farm greenhouse gas emissions, and participate in the Alberta Offset market. It succeeded the expired Tillage System Management Protocol; no information could be found on whether the Conservation Cropping Protocol was succeeded by another methodology.

Key methodology documents

- **Quantification protocol for conservation cropping**, v. 1.0[91], describing the methodology for quantifying soil carbon removals through reduced tillage (method-specific, referred to as "methodology");
- **Quantification protocol for agricultural nitrous oxide emission reductions**, v.2.1[92], describing the methodology for quantifying reduced N_2O emissions resulting from reduced application of nitrogen fertiliser under reduced tillage (method-specific, referred to as "N_2O methodology");
- **Standard for Greenhouse Gas Emission Offset Project Developers** (version 3.2) [93], describing the general rules and procedures of the programme (programme-specific, referred to as "standard");
- **Offset Project Plan Form**, to be filled in by project developers when initiating an offset project, Appendix A to Standard for Greenhouse Gas Emission Offset Project Developers[94] (programme-specific, referred to as "project plan");
- **Offset Project Report Form Template**, to be filled in by project developers on a regular basis to report on progress of their project; Appendix B to Standard for Greenhouse Gas Emission Offset Project Developers[95] (programme-specific, referred to as "reporting template");
- **Emissions Offset Registry**[96], listing all credits issued under the Alberta Offset System and providing further information to underlying projects (programme-specific);
- **Technical guidance for the assessment of additionality**, version 1.0[97], describing the process for assessing additionality of a project (programme-specific, referred to as "additionality guidance");

[91] https://open.alberta.ca/publications/9780778596288

[92] https://open.alberta.ca/publications/9781460125502

[93] https://open.alberta.ca/publications/standard-for-greenhouse-gas-emission-offset-project-developers-version-3

[94] https://open.alberta.ca/publications/standard-for-greenhouse-gas-emission-offset-project-developers-version-3

[95] https://open.alberta.ca/publications/standard-for-greenhouse-gas-emission-offset-project-developers-version-3

[96] https://alberta.csaregistries.ca/GHGR_Listing/AEOR_Listing.aspx

[97] https://open.alberta.ca/publications/technical-guidance-for-the-assessment-of-additionality

- **Standard for Validation, Verification and Audit**, version 5.2[98], specifying rules and procedures for the validation and verification of projects (programme-specific, referred to as "verification standard");
- **Technical guidance for offset protocol development and revision**, Version 2.0[99], providing guidance for developing and revising offset protocols under Alberta's emission offset system (programme-specific, referred to as "guidance for revision")

1.2.8.1 General description

The Alberta Quantification protocol for conservation cropping, Version 1.0, introduced in 2012, sets out requirements to quantify **greenhouse gas emissions reductions and carbon sequestration associated with the adoption of conservation cropping practices in the agricultural sector in the province of Alberta**, Canada. The **protocol was retired December 31, 2021**, after having generated offset credits for carbon sequestered in soil through no till farming practices for 10 years and thus no longer generates emission offsets (methodology, p. 12). It was retired because it no longer met the Alberta Offset System additionality requirements due to high market penetration of the covered activities (Government of Alberta 2022). As such, the protocol can provide interesting insights into additionality considerations for climate-friendly soil management measures in general. Furthermore, it provides an interesting case study of an important methodology under a governmental programme that was linked to a national emissions trading system.

Klicken oder tippen Sie hier, um Text einzugeben.Klicken oder tippen Sie hier, um Text einzugeben.**The agriculture-based quantification protocol for conservation is Alberta's most widely used protocol**. Both protocols account for roughly 90 per cent of projects with 122 projects in total (van Wyngaarden 2022). According to the Alberta government's estimates, the protocol certified 600,000 to 700,000 metric tons of carbon each year (equivalent to 2.2 to 2.6 Mt CO_2), which is more than one-third of all cropland emissions in Alberta (Government of Alberta 2021). Total emissions reductions and carbon sequestration from the protocols are estimated to be around 16.3 Mt CO_2e, corresponding to 23 per cent of the total carbon offset credits issued in Alberta to date (van Wyngaarden 2022).

The following activities to reduce emissions or enhance removals from soils were covered by the protocol: **new carbon stored annually in agricultural soil through no tillage** (focus for the subsequent sections); **lower nitrous oxide emissions from soils under no till management**; and **associated emission reductions from reduced fossil fuel use from fewer passes per farm field** (methodology). Rules for quantifying emission reductions related to reduced N_2O emissions as a result of applying less nitrogen fertiliser under reduced tillage are defined in the Quantification Protocol for Agricultural Nitrous Oxide Emissions Reductions for Farm Operations (N_2O methodology) which is not further evaluated as part of this study.

According to information in the registry, project developers are usually companies that cooperate with local farmers. Payments are made ex-post, after emission reductions or removals have been verified.

Credits generated through protocols that are approved in the Alberta offset system can be purchased by facilities regulated by the Alberta Technology Innovation and Emissions Reduction System (TIER). The TIER system provides different options to reduce emissions by industrial facilities, including to pay for emission reductions in the non-regulated part of

[98] https://open.alberta.ca/publications/standard-for-validation-verification-and-audit-version-5

[99] https://open.alberta.ca/publications/9781460140611

Alberta's economy, which includes agriculture.[100] **Credits generated under the conservation cropping protocol could thus be used by these facilities to offset their obligations under TIER**. The methodology states that the quantification protocol on conservation cropping has been written for project developers and farm operators implementing conservation cropping offset projects in the Dry Prairie and Parkland ecozones in Alberta.

An example project is the Carbon Credit Solutions Inc. Tillage project[101] which was renewed several times. It aimed to reduce GHG emissions and enhance carbon sequestration by implementing no-tillage systems on agricultural lands in Alberta. It has generated annual emission reductions or sequestration of 100,000 t CO_2ebetween 2015 and 2021.

1.2.8.2 Approaches for quantifying emission reductions or removals

For quantifying new carbon stored in agricultural soils as a result of no tilling, the protocol used a performance standard baseline based on 2006 Census data which set best practices for the agricultural sector. In addition it states known levels of adoption of reduced and no till agriculture within Alberta ecozones (methodology, p. 1). This baseline is used to quantify emissions under the so-called 'baseline condition' (methodology, p. 12). To calculate GHG emission reductions achieved through a project, the baseline condition is compared to practices under the so-called 'project condition' (ibid, p. 19; 30). The methodology defines sources and sinks that affect GHG emissions under different tillage management options that need to be accounted for in the quantification. Emissions under the baseline and project scenario are calculated as the sum of emissions from energy use, from carbon sequestration (discounted by a factor to account for reversal events, see section 1.2.8.4) and N_20 emissions from soils under the defined scenario (ibid, p. 21ff). The different elements are quantified on the basis of measuring the area under different tillage practices through remote sensing or GPS and applying defined emission factors for energy use, soil carbon sequestration and N_2O emissions (ibid, p. 32f). No sampling is foreseen. The baseline was static and was not foreseen to be adjusted or updated (methodology).

Farm operators quantified annual emission reductions based on annual increases in soil carbon, discounting 2006 adoption rates in the sector. Farmers could thus participate in conservation cropping offset projects regardless of when they changed their tillage practices. With rising levels of no-till practices, the potential for new carbon sequestration decreases and accordingly, the associated emission reduction coefficients that need to be applied and the resulting offset credit opportunities decrease as well (methodology, p. 2). The performance standard baseline was reviewed in 2017.

To be eligible to claim credits under the conservation cropping protocol, participating farms must be able to demonstrate

1. evidence of field practices including that they are producing annual crops,
2. that they do not exceed the required soil disturbance level and the allowable number of disturbance events,
3. that any disturbance events beyond the allowable amounts are tracked and documented as reversal events (see section 1.2.8.4),
4. that clear "ownership" to each offset credit is established and that

[100] Other protocols approved for Alberta's emission offset system include activities in the energy sector, CO_2 capture and permanent storage in deep saline aquifers, GHG emission reductions from pneumatic devices, landfill gas capture and combustion, enhanced oil recovery and vent gas reduction, see https://www.alberta.ca/alberta-emission-offset-system.aspx.

[101] https://alberta.csaregistries.ca/GHGR_Listing/AEOR_ListingDetail.aspx?ProjectId=81

5. additional farm management operations for irrigation, manure incorporation or re-seeding events are documented in the offset project report (ibid, p. 6-7; 36-41).

The methodology also sets requirements for data type, quality and management system (ibid, p. 34ff).

The principle of conservativeness is mentioned as a general principle for developing offset protocols under the Alberta offset system (guidance for revision, p. 21) and referred to in the quantification methodology for several elements. No explicit statement on the treatment of uncertainty is made in the methodology. As part of a protocol development process, any uncertainty associated with the quantification methodology should be quantified and the proposed methodology must be justified in terms of its accuracy and its application of the principle of conservativeness (guidance for revision, p. 23).

The technical guidance specifies that a protocol must address the risk of leakage (guidance for revision, p. 21f). **The quantification methodology itself does not address leakage though**.

The crediting period for tillage system management projects is set for 10 years (from 2012 to 2021; changed from an originally foreseen 20 year-crediting period) based on the amount of time required for a soil reservoir to reach saturation. This period cannot be renewed (methodology, p. vii).

For summer fallow reduction projects, a 3-year project-specific, historic baseline is used which is established at farm-level (methodology, p. 3). Reduction of summer fallow must be co-implemented with no-till practices though and cannot be a standalone-project (ibid, p. 4).

When initiating an emission offset project, project developers must submit a complete "offset project plan" which is attached to the Standard. This plan includes a monitoring plan specifying monitoring parameters and monitoring specifications as well as the frequency of monitoring (project plan, p. 7).

The principle that one carbon credit represents one metric tonne of CO_2e is not mentioned in the programme's documents, but applied in practice. GWPs are specified in the methodology (p. 5).

1.2.8.3 Approaches for assessing additionality

Additionality is a key requirement that offset protocols under the Alberta offset system need to fulfil. During the development process of new protocols, a team of subject matter experts needs to determine that the reduction or sequestration activities quantified in the protocol are additional. Furthermore, the Alberta Climate Change Office (ACCO) regularly assesses whether protocols still meet programme requirements including additionality. If this is not the case, a protocol is withdrawn as happened in the case of the conservation cropping protocol in 2021 (guidance for revision).

Additionality is assessed at the protocol level. Protocol developers must demonstrate that the activity is additional by applying a tool specified in the additionality guidance. According to this guidance, the activity must

- Not be required by law, regulation, by-law or directive in Alberta, or Canada;
- Be aligned with the guidance on penetration rate in the additionality guidance for additionality (i.e. proving that the activity is not common practices within the sector)
- Result in a net reduction or sequestration in GHG emissions and improved environmental practices (guidance for revision, p. 19).

Any time a new law, regulation, by-law or directive is implemented that impacts activities associated with one or more existing protocols, a regular surplus review is undertaken, carried out by ACCO. As part of this review, the overlap of an existing protocol with the new law is determined. The review may result in an update of the respective protocol, withdrawal of the protocol or no change depending on the extent of the overlap. Regular legal scans imply that project developers are expected to inform ACCO if a new law is implemented even if ACCO has not yet identified the overlap (additionality guidance, p. 10ff).

As part of the regular review process of existing protocols, ACCO with the support of stakeholders also checks the additionality of the protocol. This comprises a check of the assumed penetration rate and performing a supplementary barriers test that may result in changes to the protocol (additionality guidance, p. 13ff).

The additionality guidance also sets out the procedure for assessing additionality when developing new offset protocols. This includes determining the overlap with existing laws, potentially setting a penetration rate and performing a barriers test (additionality guidance, p. 17ff).

Project developers may need to provide data and other documentation from their projects for the assessment of additionality at protocol level. Additionally, they are "strongly encouraged" to identify new laws that may impact their project or the associated protocol (additionality guidance, p. 7). However, project developers are not themselves responsible for ensuring that their projects are additional.

1.2.8.4 Approaches for addressing non-permanence

To address reversal risks of the emission reduction and carbon sequestration activities credited under the methodology, a **reserve discount factor is applied that accounts for known rates of reversal occurring at a regional scale**. This reserve discount factor is 7.5% for the Dry Prairie region and 12.5% for the Parkland region. GHG emission reductions or removals that are quantified by using this discount factor are considered permanent. The discounted credits are held in a government owned "Sequestered Carbon Reserve account." They are considered to be permanently retired against possible future reversals (methodology, p. 2). For summer fallow reduction projects, a 20% discount factor is applied. (methodology, p. 75). These discount factors are re-assessed during protocol review (guidance for revision, p. 27). Project owners do not seem to be liable for any reversals beyond the application of the discount factors. No risk assessment is made to determine a project-specific reversal risk.

Reversals affecting less than 10% of a total field area are considered to be a normal part of farm operations. Reversals in this order of magnitude must be documented in the offset project report but do not affect the quantification of GHG emission reductions. Reversals affecting more than 10% of a field must be documented in the project report and affected fields must be excluded from quantification for the vintage year affected by the reversal. Such reversals may for example be caused by re-seeding or manure incorporation (methodology, p. 2). No differentiation is made between intentional and unintentional reversals.

According to the standard, an offset credit issued for a sequestration is invalid if the removal is subsequently reversed and the carbon dioxide released into the atmosphere. (standard, p. 16). It is not fully clear how this is tracked and assessed though.

No evidence could be found that reversals that occur after the end of the monitoring period specified in the project plan are addressed beyond the mechanisms outlined above. Also, no provisions could be found in the programme's documents on consequences for

not submitting project reports. It could be inferred from the verification standard, that the failure to submit a project/monitoring report would be interpreted as the failure to provide the information necessary to verify the project, so that as a consequence, it would not be verified and could thus not issue any more credits.

Project owners are required to demonstrate who holds land titles to fields in question, check annually whether ownership has changed and if so, update agreements between tenants and landowners. Project owners also need to hold rights to the carbon stored on the land and to transact offset credits (methodology, p. 36).

No specific provisions could be found on mechanisms for addressing reversals in case of insolvency of the project owner or dissolving of the standard; presumably such reversals are considered to be covered by the applied discounts to the issued credits.

1.2.8.5 Approaches for avoiding double-counting

Alberta has a **registry in place that issues unique serial numbers to verified emission reduction claims**. Through the registry, transfer of emission offsets as well as retirements are tracked (standard, p. 27f). The documents that need to be made available in the registry include comprehensive information about the project, which are partly available in the project plan (standard, p. 31). It also clearly documents the status of emission offsets, as well as the vintage year and the owners of the credits (also indicating the beneficiaries of retired credits).

Alberta seeks to avoid double issuance by specifying that an **offset credit that is used under another offset scheme or that is registered or serialised on another registry/offset scheme is invalid**. Also if two emission offsets are serialised on the Alberta registry for the same tonne of CO_2 reduction or removal, one of the emission offsets is considered invalid (standard, p. 15f). The standard also specifies that an emission offset is invalid if the associated emission reduction or sequestration is accounted towards an obligation under a regulatory requirement under another law (standard, p. 15).

A project developer is required to submit a statutory declaration confirming that the emission reductions or sequestrations resulting from the emission offset project in question has not been registered or serialised neither in relation to a regulatory requirement under another enactment nor under any other offset or other recognition scheme (standard, p. 14). This can be understood as a regulatory requirement which is reviewed and needs to be validated and verified as part of the validation and verification procedure (verification standard, p. 34).

Emission offsets generated under the methodology are only used under Alberta's TIER system, thus in a compliance market. If project developers decide to sell their emission offsets elsewhere, e.g. on the voluntary carbon market, these offsets must be removed from the registry (standard, p. 30). No provisions are in place with regard to using credits towards achieving NDCs since the methodology was withdrawn in 2020.

1.2.8.6 Environmental and social impacts

For the Alberta emission offset system no provisions could be found that require the identification and mitigation of potential negative social/environmental impacts. Monitoring of social/environmental impacts throughout crediting periods nor an impact assessment is required, there is no grievance mechanism in place, and no information is available on how information of benefits are shared with local stakeholders.

In the project plan, project owners are only required to include a risk assessment, i.a. with regard to other environmental attributes, emission offsets, and benefits a project could be generating if it was not used for generating offsets (project plan, p. 6).

No evidence could be found that a gender policy in place.

1.2.8.7 Governance questions

The Alberta emission offset system is a regulatory programme managed by the Government of Alberta that enables facilities regulated under the Technology Innovation and Emissions Reduction (TIER) regulation[102] to purchase and retire emission offsets to meet compliance obligations. **The Alberta Climate Change Office (ACCO) acts as the regulator and programme manager for the Alberta emission offset system** (guidance for revision).

In the Alberta Emission Offset System, emission offset projects are subject to the Technology Innovation and Emissions Reduction (TIER) regulation, the Standard for Greenhouse Gas Emission Offset Project Developers[103], and the relevant Alberta-approved quantification protocol (Government of Alberta n.d.).

All projects must be third-party verified in accordance with the Standard for Validation, Verification and Audit[104] before being submitted to the Alberta Emissions Offset Registry (AEOR) where each tonne is serialised. This standard outlines the requirements for validation, verification and audit under the Technology Innovation and Emissions Reduction Regulation. Third party assurance providers or auditors are required to submit a verification report using the Offset Verification Report Template (Version 3.0). Project verifiers are required to include a signed Conflict of Interest Checklist in the verification report. Validation is optional but not required in the Alberta emission offset system (standard, p. 23).

The Emissions Offset Registry is operated by the Canadian Standards Association Group in coordination with the Government of Alberta. It registers and publicly lists all applicable Alberta emission offsets. All projects listed on the registry must meet system requirements as outlined in the Standard for Greenhouse Gas Emission Offset Project Developers.

ACCO manages the development of new and revision of existing offset protocols. Protocol developers may submit a "Request to Develop" to ACCO which ACCO then evaluates and decides whether to establish a new protocol. In the development process, participants in the technical review and the draft protocol stage must achieve consensus. If this is not achieved or if ACCO determines that the protocol does not meet programme requirements (including regulatory requirements, additionality considerations or permanence issues) the development is stopped (or the protocol is withdrawn in case of a revision process). Through an internal risk assessment process, ACCO identifies protocols that need to be revised (guidance for revision).

A broad range of stakeholders is involved in the process of developing and revising new methodologies, including academic experts, consultants, the Government of Alberta, industry experts, NGOs, a protocol developer, a protocol sponsor, representatives of the public and a third-party assurance provider. The development process involves various reviews by technical experts as well as applicable government departments and a 30-day comment period by the public (guidance for revision, p. 19f).

Methodology documents are available on Alberta's website, though some documents could not be found online (e.g. the Technical Seed Document for Conservation Cropping referred to in the methodology or the further information on the sequestered carbon reserve, see section 1.2.8.4).

[102] https://www.alberta.ca/technology-innovation-and-emissions-reduction-regulation.aspx.

[103] https://open.alberta.ca/publications/standard-for-greenhouse-gas-emission-offset-project-developers-version-3.

[104] https://open.alberta.ca/publications/standard-for-validation-verification-and-audit-version-5.

There are no designated procedures in place for receiving complaints and resolving disputes from stakeholders.

1.2.9 Australian Emission Reduction Fund: Estimating soil organic carbon sequestration using measurement and models method

The 2021 soil carbon method is a guideline for soil carbon projects registered under the Australian voluntary Emission Reduction Fund. The Emission Reduction Fund (ERF) is a financing instrument providing voluntary incentives to Australian individuals or companies to reduce emissions through investments to drive technological innovation. Under the ERF, the government purchases emission reductions offered by businesses, local governments, or others, mainly through reverse auctions. The initial proposal was an offsets system linked to an Emissions Trading Scheme, however this was never implemented. There are two different types of contracts offered through the ERF auctions: Optional Delivery contracts provide the right to sell carbon abatement to the CER at an agreed price within a set time. This allows contract holders to manage their price and supply risks with a view to encourage more carbon abatement projects as a result. Fixed Delivery contract sets the obligation to provide a set number of credits (Australian Carbon Credit Units; ACCUs) at a set price for the duration of the contract. In case the agreed quantity cannot be delivered by one project, proponents can source the difference from other projects or from the secondary market.

The ERF has methodologies with rules for crediting emission reductions or carbon sequestration covering all GHGs (methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2)). To use a particular method and take part in the ERF, project developers need to apply to the Clean Energy Regulator. The Regulator develops the methods and manages project registration, compliance and crediting emissions reductions/removals for projects under the ERF.

Key methodology documents

- **Soil carbon methodology 2021 document**, which provides step-by-step guide on how to plan, register, deliver and report on soil carbon project under the 2021 soil carbon method (method-specific, referred to as „Methodology")[105]
- **Sampling guidance for measurement-based soil carbon methods**. A guidance to clarify and improve sampling assurances processes and controls for projects using the measurement-based soil carbon methods (method-specific, referred to as "Sampling Guidance")[106]
- **Native title, legal right and eligible interest-holder consent guidance (2018) guidance**, which explains how to consider the rights of native title groups and state and territory law (programme wide, referred to as "Native title")[107]
- **Emission Reduction Fund project register website** (2023), provides an overview of all registered projects (programme wide, referred to as "Project Register")[108]

[105] https://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Understanding%20your%20soil%20carbon%20project%20-%20Simple%20method%20guide.pdf

[106] https://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Sampling%20guidance%20for%20measurement-based%20soil%20carbon%20methods.pdf

[107] https://www.cleanenergyregulator.gov.au/DocumentAssets/Documents/Native%20title,%20legal%20right%20and%20eligible%20interest-holder%20consent%20guidance.pdf

[108] https://www.cleanenergyregulator.gov.au/ERF/project-and-contracts-registers/project-register

- **Emissions Reduction Assurance Committee website**, which outlines the mandate of the ERAC (programme wide, referred to as "ERAC")[109]
- **Compliance handling policy website** (2020), outlines the complaints handling policy of the ERF (programme wide, referred to as "Complaint Handling Policy")[110]
- **Purchasing ACCUs with co-benefits website** (2022), outlining the options on purchasing certificates with co-benefits (programme wide, referred to as "Co-benefits")[111]
- **Emission Reduction Fund and Permanence**, outlines the permanence obligation under the Emission Reduction Fund (programme wide, referred to as "Permanence").

1.2.9.1 General description

The soil carbon method was established in 2018 for the first time and updated in 2021. Recipient of payments can be landholders, communities, and businesses (Methodology 2021, p. 9). The methodology offers several project activities (e.g. establishing pasture, retain stubble, conversion to no tillage, etc.) but credits only carbon removals (no emissions reductions, just increased carbon stocks). So far, 150,000 Australian Carbon Credit Units (ACCUs) have been issued across two projects under the updated methodology.[112] Each carbon credit represents 1 tonne of carbon dioxide equivalent "emissions stored" (carbon removal) or avoided, taking into account discounts applying to mitigation through projects that store carbon (Methodology 2021, p. 9). An upfront payment worth up to 5.000 Dollar are available through a pilot program (Methodology 2021 p. 27). An example project is the "Turpentine Carbon Project", in Queensland (project ID: ERF102074[113]). This project increases carbon in soil in the grazing system by altering the stocking rate, duration or intensity of grazing and re-establishing or rejuvenating a pasture by seeding. The project was registered in 2015, with a permanence period of 25 years. So far 66,050 Australian Carbon Credit Units (ACCUs) have been issued.

1.2.9.2 Approaches for quantifying emission reductions or removals

The methodology allows project developers to use one of two approaches to measure or model soil carbon changes. The two methods are: 1) measurement only approach, averaging the result of soil core measurement, however with unclear samples per hectare 2) hybrid approach, estimating results using a combination of soil carbon model estimates and soil core measurements collected within a soil carbon project or a group of projects (Methodology 2021, p. 28).

The measurement only approach quantifies change in soil organic carbon stocks through random sampling. The soil sampling involves 6 steps:

1. Develop a sampling plan for the project area (including project boundaries),
2. sampling collection (by independent expert),
3. sample preparation,

[109] https://www.dcceew.gov.au/climate-change/emissions-reduction/emissions-reduction-fund/assurance-committee

[110] https://www.cleanenergyregulator.gov.au/About/complaints-handling-policy

[111] https://www.cleanenergyregulator.gov.au/Infohub/Markets/buying-accus/purchasing-accus-with-co-benefits

[112] https://www.cleanenergyregulator.gov.au/ERF/Pages/News%20and%20updates/News-item.aspx?ListId=19b4efbb-6f5d-4637-94c4-121c1f96fcfe&ItemId=1229

[113] https://www.cleanenergyregulator.gov.au/ERF/Pages/Emissions%20Reduction%20Fund%20project%20and%20contract%20registers/Project%20register/ERF-Project-Detailed-View.aspx?ListId={7F242924-BF02-45EE-A289-1ABCC954E9CE}&ItemID=508

4. laboratory analysis,
5. calculation of the organic carbon stock from the soil sampling and
6. calculation of the change in soil organic carbon stocks over time within each carbon estimation area (CEA) (Sampling Guidance).

The hybrid approach uses a 'measure-model-measure' approach, requiring estimation of carbon stocks at intervals of 1 to 5 years—but sampling is only required every 10 years. The approach offers two options: 1) Models with soil core samples or 2) models without core samples. The latter option requires sampling in at least 10% of the area to group validate the model (Methodology 2021 p. 38; Sampling Guidance p. 10).

The baseline period covers the five years prior to the application of a project using farm records. Emissions arising from livestock, tillage, synthetic fertiliser use, and lime application must be included in the net abatement calculations. If less than five years of records are available, alternative estimation techniques are allowed (e.g. using receipts, tax invoices, etc.). Changes in policies and adjustment of baselines are not foreseen (Methodology 2021, p. 29).

Eligibility criteria include that 1) the land was used for pasture, cropping or fallow land during baseline period, 2) it can be expected that soil carbon can be increased though land management activities, 3) soil sampling is possible. Area is ineligible if

1. forest land is cleared during baseline period,
2. The area is forest land or potential forest land under other ERF methods,
3. the land has building coverage of more than 1%,
4. land was subject to clearing of forest cover or draining of peatland in the seven years prior to registration application,
5. the land contains organosols (organic soil) (Methodology 2021).

In addition, the beneficiary needs to possess exclusive legal right to run the project and claim carbon credits and must have all relevant approvals, licenses, and permits that are required to carry out the land management activities (Methodology 2021).

The **monitoring and record keeping procedure** needs to be described by the beneficiary in the land management strategy (LMS). The LMS has the objective to manage expectations of what activities may influence soil carbon on the land and its quantification. It is the reference document for audits. Each project is audited with around 3 audits over the **25-year crediting period** depending on the project size and abatement estimates, including one with the first offsets report. Audit reports have to be submitted at the same time carbon credits are applied for. Audits are done by independent auditors, which have to be registered under "The Register of Greenhouse and Energy Auditors" (Methodology 2021, p. 22, 34).

Using the hybrid approach, estimation of change between modelled results and baseline carbon stocks is discounted for the **uncertainty** of the model (to maintain conservativeness). Discount rates are 5% for 100-year permanence and 25% for 25-year permanence. Highly variable differences in soil carbon stocks are discounted by 60% (Methodology 2021 p. 32). No uncertainty discounts apply to the measurement approach.

Leakage is partly but insufficiently managed by prohibiting or restricting certain activities such as: Destocking of land that was pasture, applying pyrolyzed material that is not biochar, and disturbing the soil any deeper than the baseline nominated depth (Methodology 2021 p. 30).

However, there is a lack of assessment of other potential sources not addressed under "prohibited or restricted activities."

1.2.9.3 Approaches for assessing additionality

The baseline period needs to outline if new or materially different activities are introduced (Methodology 2021 p. 16). However, the methodology does not require any financial additionality tests or regulatory additionality. It is unclear how additionality is guaranteed for the hybrid approach.

1.2.9.4 Approaches for addressing non-permanence

Projects can decide between a 25 or 100-year permanence period during which the carbon stored must be maintained. The project owner needs to demonstrate the exclusive right to run the project and claim the carbon credits. The project owner is liable for returning carbon credits if the project is terminated before the end of permanence period, land management activities are stopped, or carbon stocks are reversed before the permanence period ends (intentionally or unintentionally) (Methodology p.17). This has to be done either by sourcing the required amount at the prevailing market price, or from another project (Permanence p. 1). No information is given in case of bankruptcy. If land is sold, activities to maintain soil carbon stocks must continue. **Both permanence periods are subject to a reversal buffer of 5%. In addition, the 25-permanence period receives a 20% reduction in carbon credits ("permanence period discount")** (Methodology, p. 17). However, it is unclear if the buffer only includes projects with non-permanence risk and when the buffer is retired. There is no risk assessment in place to determine the likelihood of reversal.

1.2.9.5 Approaches for avoiding double-counting

The ERF is a public fund to buy certified offsets. The credits are not traded. There is a safeguarding mechanism in place to avoid double counting of emission reductions. But it is not clear if this applies to this methodology as well.

There is a registry system in place including a project ID, contract ID, credits issued and geographical location. The registry is publicly available (Project Register). Project proponents need to open an Australian national registry of emissions units (ANREU) account and provide certified documents submitted for application. Since the government, so far, was the only purchaser of the credits, the registry does not document the purpose for which the credits are used. No provisions are in place to avoid double registration of projects under different crediting programmes.

1.2.9.6 Environmental and social safeguards

Proof to hold and maintain the legal right to the project land in advance is necessary (Methodology 2021 p. 11). **If one or more people hold an 'eligible interest' in the land where a project is carried out an eligible interest-holders consent is necessary** (Native title p. 15). Projects subject to native title (i.e. land and waters that Aboriginal and Torres Strait Islander people can hold under traditional laws and customs) must consider native title holder interests (Native title p. 5).

Consultation of stakeholder with no legal right to the land (i.a. adjacent landowners, environmental organizations, etc.) is not mandatory.

A complaint handling policy for the Clean Energy Regulator agency is in place to handle complaints. This policy applies to all complaints, including negative feedback, complaints, and systemic issues. If complainants are unsatisfied with the handling of their complaint they can

seek external support by the Commonwealth Ombudsman, the Australian Information Commissioner or the Australian Human Rights Commissioner (Complaint Handling Policy). However, there is no specific grievance mechanisms in place for the ERF.

Negative environmental impacts are primarily managed in the methodology through a list of prohibited and restricted activities.

Prohibited activities:

- Destocking of land that was pasture unless the land is either converted to a cropping system, within a drought affected region, or where exceptional circumstances exist (for example, a disease outbreak among livestock).
- Applying pyrolyzed material that is not biochar
- After the baseline sampling round, land management activities must not disturb the soil any deeper than the baseline nominated soil depth.
- For hypersulfidic materials, lime must not be applied, and land management activities must not be conducted that would result in drainage or physical disturbance.

Restricted activities: Several activities have restrictions during the permanence period of a soil carbon project under the 2021 soil carbon method. In most cases these activities are allowed under certain conditions.

- Restrictions on clearing and thinning of forests to not incentivise projects to carry out clearing and thinning activities.
- Addition or redistribution of soil using mechanical means
- Soil amendments containing biochar
- Soil amendments containing coal
- Restricted non-synthetic fertilisers
- Irrigation

There are no requirements in place to identify and/or mitigate potential negative environmental impacts apart from the prohibited and restricted activities.

There is no gender policy in place.

Project can include other environmental, economic, social, and cultural benefits (so called "Co-benefits"), however, they are not mandatory (Co-benefits).

1.2.9.7 Governance questions

The Clean Energy Regulator is an independent statutory authority responsible for key administrative tasks under the ERF. The Clean Energy Regulator has no legislative power and is governed by a decision-making body consisting of a Chair and three Members. Members of the Regulator are appointed by the responsible minister. The Clean Energy Regulator is responsible for developing ERF methods.[114] A complaint handling policy for the Clean Energy Regulator agency is in place to handle complaints.[115]

[114] https://www.cleanenergyregulator.gov.au/ERF/About-the-Emissions-Reduction-Fund/The-role-of-the-Clean-Energy-Regulator

[115] https://www.cleanenergyregulator.gov.au/About/complaints-handling-policy

The Emissions Reduction Assurance Committee (ERAC)[116] is an independent statutory committee responsible for assessing the compliance of methodologies against the Offsets Integrity Standards to ensure the integrity of the ERF. ERAC issued statements are publicly available.

The ERAC:

- advises the Minister on whether to make, vary or revoke methods based on their assessment of their compliance with the Offsets Integrity Standards
- undertakes periodic reviews and crediting period extension reviews of methods
- undertakes consultation on proposed new and varied methods
- undertakes consultation on periodic and crediting period extension reviews
- advises the Minister and the Secretary of the Department of Industry, Science, Energy and Resources on the outcomes of reviews.

Methodology documents are available to all through the project registry. **Project documentation including reports are not publicly disclosed**.

Validation of projects before crediting begins is not in place. Auditing takes place during the crediting period. The number of audits depend on size of the project; the first audit occurs with the first offset report. The audits are done by external auditors (Methodology 2021, p. 34). However, there is a lack of transparency the auditing process and project documents are not publicly disclosed.

1.2.10 Label bas Carbone – Methode Plantation de Vergers (Orchard plantation method), 23rd October 2020 version

Label bas Carbone (LbC) was established and is managed by French Ministry of Ecological and Solidarity Transition. **It was established in 2018 as a framework for voluntary carbon removals and GHG emissions reductions in France**. In March 2023 it offered 11 methods, with a focus on mitigation methods in the agricultural/forestry sectors, though it also has methods for other sectors, e.g. building renovation, with additional methodologies being developed (website, / presentation-des-methodes-du-label-bas-carbone). LbC-specific methods are developed by private actors (Ibid.). Projects are funded by external funders, who coordinate directly with project operators and negotiate prices to fund all or part of a project; no certificates change hands and cannot be traded, instead the funder receives official recognition from the administrator that they funded a project that delivered a specified amount of t CO_2e of mitigation (website, /financer-un-projet).

Key methodology documents

- **Label bas Carbone (LbC) website**, which presents all general information on the mechanism as well as methodological and other documents (programme wide, referred to as "website")[117]

[116] https://www.cleanenergyregulator.gov.au/ERAC/about-the-emissions-reduction-assurance-committee

[117] https://label-bas-carbone.ecologie.gouv.fr/

- **Orchard Plantation method website**, which provides introduction to the methodology (method-specific, referred to as "method website")[118]
- **Label bas Carbone – Méthode Plantation de Verger** – version du 23 octobre 2020, the methodology document (method-specific, referred to as "method")[119]
- Label bas Carbone, **Décision du 15 septembre 2022 portant 77 creation du groupe scientifique et technique du label Bas-Carbone**, a Minisitry of Energy Transition decision establishing a Scientific and Technical group (programme wide, referred to as "scientific group").[120]
- **Standard document:** Référentiel du label « Bas-Carbone » (annexé à l'arrêté du 28 novembre 2018 modifié par l'arrêté du 11 février 2022)[121], an appendix attached to the legal decree that established the Label bas Carbone (revised in 2022) that establishes general rules for the Label (programme wide, referred to as "standard")

1.2.10.1 General description

The Orchard Plantation Method was developed by Compagnie des Amandes, a private company, with support from experts, and approved by the LbC in 2020 (method website). It is project-based, focussed on planting a perennial fruit crop (an orchard) on land not currently cultivated for this purpose. Mitigation is credited for carbon sequestration in soil/tree biomass, reduction in emissions on site (and reduced indirect emissions e.g. N_2O from reduced fertiliser use), and optionally the substitution effect of replacing fossil fuel use (method, p.9). The methodology covers CO_2 and N_2O gases and the carbon reservoirs soil carbon and tree biomass and rootstock (method, p.9).

According to LbC website, **mitigation certified under the methodology can be used for offsetting emissions** (standard, part B). Mitigation is recognised both ex ante (for removals, i.e. carbon sequestration in biomass and soil estimated at project verification) and ex post (for direct and indirect emissions reductions) (method, p. 9). As of March 2023, a total of 21 Orchard Plantation projects are listed on the LbC website, with potential mitigation equivalent to 14,000 t CO_2e; only one project is listed as receiving finance (with 21% of its 4575 t of mitigation already financed) (website, /projets). The price is not published. Previous studies reported LbC forestry-related projects being funded at a rate of €15-40/t CO_2e (Ecologic; Ramboll; Carbon Counts 2021). Overall, LbC per tonne prices are reported as ranging from €8-125 t CO_2e, with an average of €35 (website, /financer-un-projet). Payments go to those running the project, who are either individual or groups of farmers, or project managers. The amount reaching the farmer depends on the methodology: Réseau Action Climat (2023) reports that for the CarbonAgri, Hedgerow, and Field Crops methods, intermediaries can capture as much as 40% of the payment.

An example project is "La Granja", in the Occitania region (website, /projets/la-granja). It consists of converting cereal mono-culture into almond trees. Planting began in 2022, with 30 ha planted in the first year and 40 ha in the second year. The carbon storage (after rebate) is 3,975 t CO_2e (with 1,894 t CO_2e stored in the soil and 2,081 t CO_2e in biomass) over the 20-year project

[118] https://label-bas-carbone.ecologie.gouv.fr/la-methode-plantation-de-vergers

[119] https://www.bulletin-officiel.developpement-durable.gouv.fr/documents/Bulletinofficiel-0031558/TRER2028101S_Annexe.pdf;jsessionid=69B83918346CD6884224A9A3FB7D5E47

[120] https://www.bulletin-officiel.developpement-durable.gouv.fr/documents/Bulletinofficiel-0032640/ENER2226837S.pdf

121 https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000045279167

duration (as estimated by the methodology). It is currently 21% funded (based on an interview with the Direction Générale de l'Énergie et du Climat, France).

1.2.10.2 Approaches for quantifying emission reductions or removals

The methodology establishes clear **eligibility criteria** (methodology, p. 6, 8): the method targets the planting of perennial fruit crop (orchard) on land that is not currently in this use, i.e., is currently cultivated agricultural land (e.g. arable, grassland, or perennial crops such as vineyards). It targets a specific list of orchard crops: dried fruits (almond, chestnut, hazelnut, walnut), pome fruit (apple, pear, quince, fig), or stone fruit (apricot, cherry, peach, nectarine, plum). Olive trees and small fruits (such as berries) are excluded. To be eligible, the orchard must be planted with a tree density greater than or equal to the density criteria required for French AgriMer aid for orchard renovations (methodology, p. 17). The project owner must also demonstrate that their total area under perennial tree crops increases, relative to the average of the three years preceding the project (i.e. they are not just replanting after cutting down other orchards on their same farm); this must be proven using EU-CAP declarations, aerial photos, or, if a new holding, evidence of planting (methodology, p. 17). Projects must also deliver a net increase in total (soil + biomass) carbon stock and implement permanent grassland on at least 50% of orchard surface (*Ibid.).*

The project boundary is determined by the edge of the to-be planted orchard area. The method only applies to land that is not currently an orchard (does not apply to existing orchards) (i.e. project-based). The boundary does not include the borders of the orchard (where hedgerows can be planted);[122] the method also excludes agricultural land that is afforested and used in agro-forestry projects (with a mix of trees with crops or livestock) (methodology, p. 10).[123]

The project duration (crediting period) is 20 years for carbon storage in woody biomass and soils (i.e. average expected project storage is estimated based on project duration of up to 20 years), and five years for other mitigation actions (methodology, p. 9-10). Emission reductions are calculated ex-post for the first five years of the project (the period prior to the audit) (based on an interview with the Direction Générale de l'Énergie et du Climat, France). **Mitigation impacts are calculated against a project-specific baseline scenario.** The baseline scenario should establish what activity and land use would have occurred on the plot of land in absence of the orchard planting. LbC baseline scenarios are supposed to reflect regulatory obligations, economic incentives ("whatever their origin"), and current practices (methodology, p. 18). In the Orchard methodology, the baseline scenario is defined by assuming that the activity (as defined by EU-CAP crop denominations) that was carried out on the plots for the three years before project start would have continued (methodology, p18.). However, if different agricultural uses have occurred over the last three years, then the last activity is taken and accounted for the three year baseline (methodology, p.19, and based on an interview with the Direction Générale de l'Énergie et du Climat, France).[124] There are no assessments of whether this reflects economic incentives, regulations, etc. and there is no updating of the baseline (including in the case of reversals).

Projects can have three sources of mitigation recognised: 1) carbon storage, 2) direct emissions reductions, and 3) indirect emissions reductions. The direct emissions reductions

[122] Mitigation through hedgerows can be calculated using a separate LbC Hedgerow methodology.

[123] Afforested land is covered by LbC Afforestation method; an agro-forestry method is being developed.

[124] e.g. if in year n-1 and n-2 grassland and cereals in year n-3, the baseline would be assumed to be cereals. If in year n-3 there was corn, in year n-2 carrots, and in year n-1 beetroot, they all belong to the same category and in this case, the average emissions over the three-year period would be calculated, considering the emission factors specific to each crop.

and carbon storage apply only to the project boundary defined by the edge of the new orchard area to be planted, while the indirect emissions reductions consider reduced emissions induced through reduced fossil fuel/fertiliser consumption and their associated emissions. Mitigation through increased carbon storage are calculated over the lifetime of the 20 year project, while the other mitigation outcomes are calculated only over the first five years of the project (methodology, p. 9). The methodology explicitly states which gases and carbon sequestration sources are covered (N_2O from reduced nitrogen fertiliser application; CO_2 from reduced fossil fuels/substitution and CO_2 for carbon stored in soils and biomass) (methodology, p.9-10).

Carbon storage in woody biomass is calculated relative to the baseline scenario using Verra's "long-term average stock method", which considers the average carbon stock over the duration of the project (assuming that orchards are cut down at completion of the 20-year project period). The baseline carbon storage is based upon the baseline land use (crop/meadow/ viticulture/orchard), i.e. a simple look-up table (methodology, p.29). The project carbon storage is also estimated using simple look-up tables. The method does not differentiate between types of orchard and the only difference between contexts is differentiating between Mediterranean area and non- Mediterranean area orchards (methodology, p.28). This means all orchards in the Mediterranean area, regardless of their type, cropping method, or specific location, are assumed to sequester 14.3 t C/ha; those outside the Mediterranean area are assumed to sequester 16t C/ha (methodology, p.28). A discount of 10% is applied to this calculation "to take into account variability that can exist between different species and cultivation practices"; the selection of this figure is not justified (methodology, p. 28). This can be adjusted after monitoring after five years: projects must have an expert visit to assess density and measure the average trunk circumference of a sample of 20 trees (no instructions on selection of tree samples is included); if the trunk circumference is less than the average species'[125] circumference and/or density is less than 80% of the expected density, then the biomass sequestration will be discounted according to how far it deviates from species average circumference (methodology, p.36).

Carbon storage in soil carbon is calculated similarly to above-ground biomass, comparing estimated relative storage under the project to the baseline. Simple look-up tables differentiate only between Mediterranean and non-Mediterranean locations. Baseline soil carbon storage is determined based on baseline land use (either vine, permanent meadows, or crops). Project soil carbon storage is assumed to be the same for all Mediterranean orchards and all non-Mediterranean orchards, with additional storage calculated depending on the percentage of the orchard surface that is grassed (methodology, p.30). No uncertainty discount applies, despite the methodology identifying that the calculation of carbon storage in soils is of "medium" uncertainty due to the use of national averages with no recognition of the type of soil or cultivation practices (methodology, p.32). No soil sampling is carried out at any point during the project. Grass coverage is monitored only at year five. Soil carbon estimates are based on top soils (0-30cm of depth), with no mention of other soil depths.

Direct emissions reductions refer to two sources of reductions, avoided (net) emissions from baseline agricultural activity, and reduced emissions associated with the production of fossil fuels and fertiliser used under baseline. The avoided emissions from baseline agricultural activity are most significant. The method allows these to be calculated in two ways: by use of simple look-up table, which estimates average French emissions associated with types of crop production (e.g. "Potato for consumption intended for industry", 3.8 t CO_2e/ha; or Tomato for fresh consumption, […] under cover", 763 t CO_2e/ha) (methodology, p. 37); a 15% discount applies to this method due to uncertainty (no explanation is given how the 15% figure is

[125] This is the only reference to a specific species. The species planted does not affect the estimated sequestration.

established). Alternatively, project developers can use a more complex approach (subject to no discount), which considers e.g. direct and indirect use of nitrogen fertiliser and energy use (methodology, p. 27).

Indirect emissions reductions may be optionally included if the co-products of the orchard are used for energy (e.g. fruit shells).[126] This is calculated using emissions factors to calculate substitution effects (methodology, p.28).

Uncertainty of quantification is discussed in a limited way in the methodology. The methodology identifies that medium uncertainty applies to the calculation of carbon storage in woody biomass, soil carbon, and emissions factors (methodology, p.31-32). A discount for uncertainty is applied to woody biomass calculations of 10% but no discount is applied to the other elements; no justification is given for how the discount is selected or why only one of the "medium" uncertainty elements of quantification is discounted but not others.

There is no mention of or adjustment for leakage.

The project must be **pre-validated**: the project developer submits a completed form to the LbC authority, who review the project plan and can ask questions/request alterations to ensure that the project is in line with the methodology (methodology, p. 7).

Monitoring and verification occurs only once, after five years. At this point, the project developer submits a monitoring report (in LbC format), which reports the emissions reductions achieved and submits data on indicators, along with an auditor report, and evidence that the auditor is independent (methodology, p.7). This must be based on a site-visit by an expert to measure tree circumference and estimate grass cover and tree density, along with evidence including plant invoices and a photograph of the orchard (methodology, p. 16). Based upon this monitoring report, the amount of emissions reductions achieved in the first five years will be recognised (ex post), as will the estimated carbon storage mitigation for the whole course of the project (20 years, thus for 15 years ex ante). There is no further monitoring or verification over the remainder of the project duration (up to 20 years) or after crediting period ends, accordingly, no emissions reductions after the first five years are recognised.

1.2.10.3 Approaches for assessing additionality

The methodology document provides some evidence that orchard planting could be additional and go beyond regulatory requirements: in France, the overall area of orchard coverage and number of orchard farmers have decreased over the past few decades (though the area of some types of orchards have grown, e.g. kiwifruit); orchard planting involves relatively large upfront costs; and orchardists receive relatively small upfront public support (e.g. less than 10% of upfront costs) (methodology, pp. 20-23).

To demonstrate **project-level additionality**, project developers are only required to demonstrate that eligible public aid for planting is less than 50% of pre-harvest investment costs (methodology, p.23). The project owner is required to report all granted subsidies, which will be verified in year n+5 to demonstrate the financial additionality of the project (based on an interview with the Direction Générale de l'Énergie et du Climat, France), e.g. the profitability of the project or other public support other than planting aid such as ongoing subsidies (methodology, p. 24). Based on evidence provided by the methodology, the current average planting aid is less than 10% for all orchard types, meaning every orchard would pass this additionality "test" (methodology, pp. 22-23). There are no other additionality tests, e.g. no regulatory additionality tests or barrier tests.

[126] Note, pruning wood is excluded as an energy substitution source, as it is important that it returns to the soil (methodology, p.28)

1.2.10.4 Approaches for addressing non-permanence

LbC requires methodologies to consider the risk of non-permanence due to climatic, biotic, or human hazards (methodology, p. 35). Carbon stored in soil or woody biomass could be reversed. The methodology considers that the risk of non-permanence during the project period after crediting (i.e. year 5-20) due to human factors is low (due to the relatively high upfront investment costs of orchard planting – although this is a sunk cost), and that fire and biotic risks are low (p. 35). The methodology applies a 10% non-permanence discount to mitigation through soil carbon storage and biomass to account this risk, which is the minimum discount rate of LbC standards (based on an interview with the Direction Générale de l'Énergie et du Climat, France). This discount does not apply to the other mitigation credited by the methodology (e.g. downstream indirect emissions impacts), as these are not at risk of reversal.

The method considers that, on average, the life expectancy of orchards is around 20 years. Therefore, after that period, orchards have to be uprooted to plant new orchards (methodology, p. 35). There is a legal requirement in France to use the wood either for energy purposes or by crushing and spreading woodchips on the soil in an attempt to increase soil carbon (based on an interview with the Direction Générale de l'Énergie et du Climat, France). However, the methodology provides no evidence about the net climate impacts of this approach and whether it effectively increases the carbon storage time or replaces fossil fuel use.

There is no monitoring, reporting or verification required after the one monitoring report and assessment that occurs five years after project initiation (methodology, p.36). The methodology contains no reference to enforcement of permanence or penalties for non-compliance or liability for compensating removals. However, there is a general competence of the authority to control the project during its duration and to ensure that the project complies with the LbC rules. In the event of fraud or major inaccuracy the label can be withdrawn (standard, p. 20). There is no protection in the case of sale of land or bankruptcy. There is no requirement for the project manager to be the landowner or to demonstrate rights to act on the land (the project manager simply must present the SIRET code which allows the geographic identification of any French establishment or business) (based on an interview with the Direction Générale de l'Énergie et du Climat, France).

1.2.10.5 Approaches for avoiding double-counting

LbC encourages buyers to fund LbC projects to "contribute to France's climate strategy, to voluntarily offset your CO_2e emissions or because you have a legal obligation to offset your emissions, in application of the law", this includes meeting compensation requirements under the Environment Code (website, /financer-un-projet). There are currently two obligations in the French law (Environmental Code) that establish offsetting obligations for aircrafts operators that operate flights within France (e.g. Paris-Nice) and the obligation for coal power plants to offset their emissions above an established threshold (based on an interview with the Direction Générale de l'Énergie et du Climat, France). Projects are not recognised by CORSIA. In return for funding projects, the buyer can communicate that they have funded the project (with the accompanying mitigation impact). LbC offers the chance for funders to register that they have funded a project, although this is not required (website, /financer-un-projet). Any actor can fund a project; there are no requirements on funders (website, /financer-un-projet). They do not receive fungible carbon credits; the mitigation claim can only be purchased once and cannot be traded (website, /financer-un-projet).

LbC has a **public registry of projects** (website, /liste-projets-labellises), which lists the project developer, a very brief description of the project, contact details of the project developer, and

percentage of project funded. Funders communicate directly with project developers, with no role played or checks made by LbC (website, /financer-un-projet).

To avoid **double-counting with other LbC methodologies**, the project boundary is explicitly set at the edge of the planted orchard (and does not include e.g. the hedgerows, which are covered by a different LbC methodology) (methodology, p.8).

There do not appear to be other controls to avoid double-counting of mitigation: there are no provisions in place to avoid registration of projects under different crediting programmes or to avoid using mitigation outcomes under domestic mitigation schemes.

1.2.10.6 Environmental and social impacts

There are limited obligatory environmental or social safeguards. The methodology provides a template and qualitative scoring system for project leaders to monitor and report identified co-benefits (biodiversity, water resources, soil preservation, and socio-economic issues) (methodology, p. 32). However, this entirely optional. There are, e.g. no requirements for use of mechanical (rather than chemical) weed control, or planting of diverse species, etc. The one exception is the requirement for a minimum of 50% of the orchard land area to be grassed, which supports mitigation as well as co-benefits of soil fertility, erosion, habitats (methodology, p.17).

The methodology contains a limited stakeholder consultation and no grievance mechanism, no gender policy, no ownership or soil rights policy, or benefits sharing systems. All LbC methods have a three-week stakeholder comment period when the methodology was developed but no subsequent path for stakeholders to influence the methodology or projects (website, /presentation-des-methodes-du-label-bas-carbone). There is no requirement to carry out an impact assessment. In case a project owner decides to indicate co-benefits (voluntary) they should be verified by independent auditors (based on an interview with the Direction Générale de l'Énergie et du Climat, France).

1.2.10.7 Governance questions

LbC is principally managed by the French Ministry for Ecologic and Solidary Transition (MTES), which established the programme. They are also responsible for validating methodologies, which are developed by private actors and assessed by a MTES-managed scientific and technical group. The Regional Departments of the Environment, Planning and Housing (DREAL) and overseas, by the Departments of Environment, Planning and Housing (DEAL), have the responsibility for validating and verifying projects.

To develop new methodologies for LbC, individuals can propose methodologies, which must be approved by the Ministry. Method developers must confirm that there is no overlap with existing method scopes, then notify LbC of their plans with some detail of proposed methodology. LbC provides initial feedback, which if positive, the method developer can then develop a detailed draft method. The methodology is then subject to three weeks public consultation and review by the LbC scientific and technical group, which features representatives from public and civil society including e.g. representatives from government offices on biodiversity, agriculture, forestry, etc., as well as civil society (e.g. I4CE, an institute for climate economics, and environmental NGOs) (scientific group, page 1-2). (website, /presentation-des-methodes-du-label-bas-carbone). The method developer then adjusts their method based upon the public and scientific and technical group feedback.

There is only a small window for public consultation of three-weeks for the public to comment on proposed draft methodologies (website, /presentation-des-methodes-du-label-bas-

carbone). There are no other avenues for public consultation or stakeholder complaints. However, stakeholders can directly contact the LbC team (based on an interview with the Direction Générale de l'Énergie et du Climat, France).

Transparency is mixed. Methodologies are publicly available. Project documents are not publicly available. Funding information (including price paid or information on the funder) is not publicly available, though funders can make themselves publicly known by registering on the website (website, /financeur).

Auditors (who carry out verification and validation of projects) must be competent in the project area that that they are auditing; this is deemed to have been met if they are recognised or accredited by an appropriate body (e.g. Forest Stewardship Council, Verified Carbon Standard, French air pollution inventory system, a body approved by Joint Implementation or Clean Development Mechanism bodies) (standard, part IV. 2.). They must also be independent (standard, part IV.2).

2 References

Carbon Plan (2021a): Soil carbon protocols. Online available at https://carbonplan.org/research/soil-protocols, last accessed on 24 Nov 2022.

Carbon Plan (2021b): Zelikova, J.; Chai, F.; Freeman, J.; Cullenward, D. A buyer's guide to soil carbon offsets. Carbon Plan, 2021. Online available at https://carbonplan.org/research/soil-protocols-explainer, last accessed on 16 May 2023.

Ecologic; Ramboll; Carbon Counts (2021): McDonald, H.; Bey, N.; Duin, L.; Frelih-Larsen, A.; Maya-Drysdale, L.; Stewart, R.; Pätz, C.; Naae, M.; Heller, C.; Zakkour, P. Certification of carbon removals. Part 2: A review of carbon removal certification mechanisms and methodologies. Ecologic; Ramboll; Carbon Counts. Umweltbundesamt Austria (ed.), 2021. Online available at https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0796.pdf, last accessed on 16 May 2023.

Fritz, C., J. Geurts, S. Weideveld, R. Temmink, N. Bosma, F. Wichern, F. Smolders en L. Lamers, (2019 (2017): Effect van peilbeheer en teeltkeuze op CO2-emissies en veenoxidatie; Meten is weten bij bodemdalingmitigatie. In: *Bodem* 2, pp. 20–22.

Goddard, T. (2021): Climate-Change Policy for Agriculture Offsets in Alberta, Canada. In: Regenerative Agriculture: Springer, Cham, pp. 95–104. Online available at https://link.springer.com/chapter/10.1007/978-3-030-72224-1_8.

Government of Alberta (2021): Agricultural carbon offsets – Conservation Cropping Protocol. Online available at https://www.alberta.ca/agricultural-carbon-offsets-conservation-cropping-protocol, last accessed on 14 Mar 2023.

Government of Alberta (2022): Memorandum: Clarification on withdrawal of the quantification protocol for conservation cropping, 2022. Online available at https://www.alberta.ca/assets/documents/aep-clarification-on-withdrawal-of-the-quantification-protocol-for-conservation-cropping.pdf, last accessed on 29 Mar 2023.

Government of Alberta (n.d.): Alberta Emission Offset System. Online available at https://www.alberta.ca/alberta-emission-offset-system.aspx, last accessed on 14 Mar 2023.

Hammond; J.; Angelyca A.; Motew, M.; Brummitt, C. D.; DuBuisson, M. L.; Pinjuv, G.; Harburg, D. V.; Campbell, E. E.; Kumar, A. A. (2021): Implementing the Soil Enrichment Protocol at Scale: Opportunities for an Agricultural Carbon Market. In: *Front. Clim.* 3. DOI: 10.3389/fclim.2021.686440.

Jurasinski, G. e. a. (2016): Greenhouse gas emissions. In: Wichtmann, W.; Schröder, C. and Joosten, H. (ed.): Paludiculture - productive use of wet peatlands. Climate protection - biodiversity - regional economic benefits. Stuttgart: Schweizerbart Science Publishers, pp. 79–93.

Réseau Action Climat (2023). Positionnement sur le Label bas Carbone et les methodes pour le secteur agricole. Réseau Action Climat, 2023. Online available at https://reseauactionclimat.org/wp-content/uploads/2023/01/positionnement-label-bas-carbone-rac-mise-a-jour.pdf, last accessed on 16 May 2023.

Sellars, S.; Swanson, K.; Zulauf, C.; Schnitkey, G.; Paulson, N. (2022): Agricultural Carbon Markets: A Case Study of Alberta. In: *farmdoc daily* 12 (58). Online available at https://farmdocdaily.illinois.edu/2022/04/agricultural-carbon-markets-a-case-study-of-alberta.html.

U.S. Department of Agriculture (2014). Quantifying greenhouse gas fluxes in agriculture and forestry: Methods for entity-scale inventory (Technical Bulletin, 1939). U.S. Department of Agriculture. Eve, M.; Pape, D.; Flugge, M.; Steele, R.; Man, D.; Miley-Gilbert, M. and Biggar, S. (ed.), 2014. Online available at https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf, last accessed on 16 May 2023.

van Wyngaarden, S. (2022): Carbon credit systems in Alberta agriculture (SPP Technical Paper, Volume 15:18), 2022. Online available at https://www.policyschool.ca/wp-content/uploads/2022/06/JSC16_CarbonCreditSystemsABAgric.Wyngaarden.June9_.pdf, last accessed on 29 Mar 2023.