AgriCaptureCO_2

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Regenerating soils for climate and farmers

[June 2022]

D4.1 Suitability Assessment for Legal & Voluntary Schemes

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Table of contents

Executive summary

The AgriCaptureCO2 project seeks to make it easier and more profitable for farmers to adopt regenerative farming practices. We bring together pioneering farmers, agronomists, soil scientists, public bodies, and technology experts working in 6 pilot sites across Europe and Africa to co-develop a suite of valuable services powered by satellite data. At the same time, we are developing and promoting a European Regenerative Agriculture Community to facilitate engagement and knowledge transfer. WP4 aims to support the project's goal uptake through certification of projects, reductions and potential generation of carbon credits that will create financial incentivization. Within this report we assess the suitability of several legal and voluntary carbon credit frameworks and their approaches for measuring, reporting and verification of Soil Organic Carbon and greenhouse gases (GHGs). We also assess their approaches to dealing with structural considerations that present risk and opportunity for generating high integrity carbon credits.

We identify key risks and gaps that exist across current frameworks:

- Disincentivizing deep carbon reductions required to meet 1.5°C Pathway
- Safeguards for integrity, environmental protection, soil health, biodiversity, and social risks
- Measurement and uncertainty: baselines, monitoring, reporting and verification (MRV)
- Risk of reversal
- Lack of permanence of storage
- Risk of leakage
- Demonstrating additionality
- Double counting, "double claiming" and tracking credits

Risks will be mitigated by following the VERRA framework and associated methodology (VM0042) enabling reduced barriers and multiple regenerative practices in one project.

Integrity is further enhanced applying the proposed 'Best Practice Blueprint':

- Buyer alignment to a net zero aligned reporting framework.
- Climate, Community & Biodiversity (CCB) Standards.
- Application of approved MRV platform, costs are added to the price of the credit.
- Apply and obtain letter of authorisation by the host country.
- Additional Requirement: Alignment with Article 6.

It is identified that companies with agricultural supply chains should prioritize SOC sequestration as part of an insetting strategy to reduce/remove identified risks.

The success of our blueprint will be tested for integrity as part of our research (GBSF).

Table of figures

Table of tables

List of abbreviations

CAP	Common Agricultural Policy
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
COP	Conference of Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
CRB	Climate, Community & Biodiversity
EEB	European Environmental Bureau
ETS	Emissions Trading Scheme
GBSF	Great British Sustainable Farming
GHG	Greenhouse Gas
ICAP	International Carbon Action Partnership
IFCPS	International Finance Corporation's Performance Standards
IPCC	Intergovernmental Panel on Climate Change
MRV	Monitoring, Reporting and Verification
NDCs	Nationally Determined Contributions
NGO	Non-Governmental Organization
SBTi	Science Based Target initiative

SDGs	Sustainable Development Goals
SOC	Soil Organic Carbon
UNCNNow	United Nations Climate Neutral Now
UNDP SES	United Nations Development Program's Social and Environmental Standards
VALID	Verifiable, Additional, Leakage, Irreversible, Double counted.
VCM	Voluntary Carbon Market
VCMII	The Voluntary Carbon Markets Integrity Initiative
WWF	World Wide Fund for Nature

1 Introduction

In one possible scenario of our future, the international community continues down the current track of business as usual towards the consequences of catastrophic climate change. Poverty increases, food security for a large part of global population fails, and economies across the world suffer. In another future scenario, we limit global warming to 1.5°C - the build-up of greenhouse gases is brought under control, and nations invest in solutions to reduce environmental stresses, provide safety for communities and global economic stability.

To achieve this, the world must halve existing greenhouse gas emissions by 2030 and achieve net-zero emissions by 2050. Globally, we need to set out and closely follow a pathway to net zero. The private sector has a huge role to play and every business needs to adjust its business model and develop credible transition plans.

Companies around the globe are increasingly committing to achieving net-zero carbon emissions, sometimes through a regulatory nudge and sometimes voluntarily. However, a recent report found that just 19% of the FTSE 100 (i.e. 100 of the biggest companies listed on the London Stock Exchange) have long-term emissions reduction targets to meet net-zero goals and only 3% have a long-term emissions reduction target aligned with limiting global warming to 1.5°C with most having no provision for sequestration (EcoAct, 2021).

The change in global emissions from this year to the next could be a defining moment; all large companies need to be proactive in achieving sustained emissions reductions and decarbonising their business models. In order of priority, organisations and individuals need to:

i. Reduce,

ii. Report and

iii. Compensate.

Direct emissions reductions should be the priority. However, offsetting is an important mechanism to ensure that companies are taking urgent action on any emissions they are still working to reduce – this is particularly important in hard-to-abate economic sectors, especially where low carbon solutions are not yet economically or commercially available (EcoAct, 2021).

Carbon removals refer to anthropogenic activities that remove carbon dioxide (CO_2) or other forms of GHGs from the atmosphere and store them durably in geological, terrestrial, or ocean reservoirs, or in products (IPCC AR6 WG3 Ch. 12, 2022). It is widely recognised that carbon removals should not replace but must complement rapid decarbonisation. As shown in Figure 1, modelled mitigation pathways that limit warming to 1.5°C, and 2.0°C, involve deep, rapid, and sustained emissions reductions:

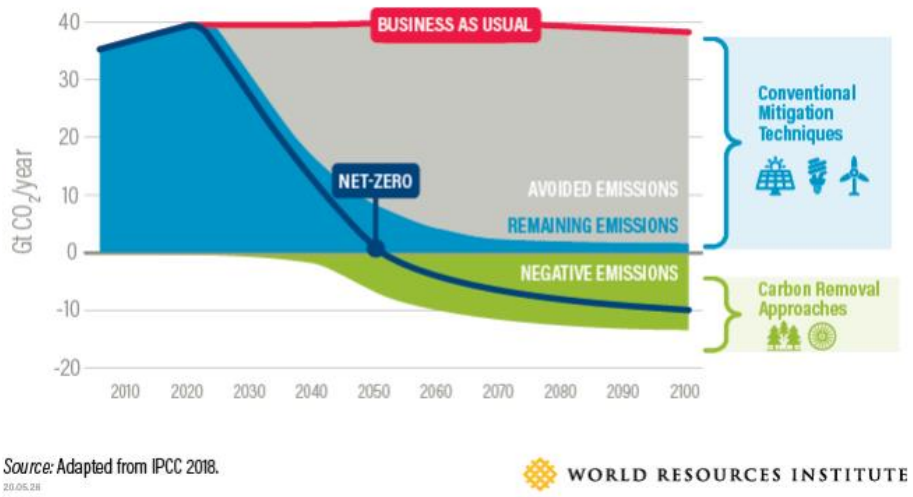

Figure 1: Staying Below 1.5 Degrees of Global Warming (WRI, 2017)

1.1 What is a Carbon Credit

A carbon offset broadly refers to a validated reduction in GHG emissions – or an increase in carbon storage that is used to compensate for emissions that occur elsewhere. Carbon credits are issued as a part of a carbon removal or avoidance project in accordance to the emissions which were reduced or removed (standardised in the equivalent amount of carbon dioxide). Each credit confers an offset of a certain amount of carbon, usually one ton CO_2 per credit. The credits are purchased by a company or a country in compliance or voluntary markets.

A carbon credit that is being used for the purpose of offsetting is a transferrable instrument certified by governments or independent certification bodies to represent an emission reduction of one metric tonne of CO_2, or an equivalent amount of other GHGs. Carbon credits are uniquely serialized, issued, tracked, and cancelled by means of an electronic registry.

1.2 Carbon Markets

There was close collaboration between AgriCaptureCO2 partners assessing carbon credits (in WP5) and relevant AgriCaptureCO2 use cases to gauge the feasibility and desirability of carbon credit certification in the specific context of each use case.

A large-scale green finance mechanism could be one of the key mechanisms contributing towards achieving the goals of the Paris Agreement – providing the financial incentive (and indeed means) to enable investments in emissions abatement projects. A liquid voluntary carbon market at scale could also move private capital to the Global South where the bulk of potential for "nature-based" projects is located, in turn generating other environmental, social, and economic co-benefits, including:

- Enhancing biodiversity
- Supporting local communities and job creation
- Improving health outcomes from avoided pollution

As with many products whose quality is difficult for casual buyers to assess, standard-setting organisations have been established to provide quality assurance for carbon offsets. These programs range from international or governmental regulatory bodies – such as the United Nation's Clean Development Mechanism (CDM) – to independent non-governmental organizations (NGOs). Offset programs perform three basic functions:

1. develop and approve standards that set criteria for the quality of carbon offset credits;
2. review offset projects against these standards (generally with the help of third-party verifiers); and
3. operate registry systems that issue, transfer, and retire offset credits (Carbon Offset Research and Education program, 2022).

Carbon offset credits are not a simple commodity, the carbon market is fragmented, and the rules and governance of carbon crediting programs are inconsistent, including as they relate to common challenges and pitfalls that are discussed within this report. This has led to concerns that available credits lack integrity. An overview of such challenges as they relate to carbon dioxide removals can be found in the following webinar, co-hosted by the European Environmental Bureau (EEB), one of the AgriCaptureCO2 partner organisations, a summary of identified risks have been shared below: Click to access the webinar: Carbon Dioxide Removal in the EU: Pitfalls and Opportunities

1. Disincentivizing deep carbon reductions required to meet 1.5°C Pathway
2. Safeguards for integrity, environmental protection, soil health, biodiversity and social risks
3. Measurement and uncertainty: baselines, monitoring, reporting and verification (MRV)
4. Risk of reversal
5. Lack of permanence of storage
6. Risk of leakage
7. Demonstrating additionality
8. Double counting, "double claiming" and tracking credits
9. Double Counting, "Double Claiming" and Tracking Credits

Models suggest that the combined effects of uncertainty and overestimated removals potential can result in a +0.7°C additional temperature increase from the 1.5°C target pathway (McLaren, 2020). As governments make use of carbon credits to meet nationally determined contributions (NDCs), and as organisations purchase credits to compensate for unavoidable emissions, an awareness of these perceived risks is important to ensure action can be taken to mitigate them.

1.3 Regenerative Agriculture

Land use change and conversion of native soil to agriculture has led to significant reductions in global soil carbon stocks. This loss of organic matter and reduced soil fertility, threatens crop yield stability and environmental balances across the world. The resulting land degradation decreases food security, diminishes rural livelihoods, and threatens freshwater systems (Oldfield, E.E. et al. 2021). Since the onset of agriculture around 8,000 years ago, soils have lost around 140–150 Gt C through conversion of land to agriculture and through implementing practices that diminish soil carbon (~510–550 Gt CO_2; Sanderman et al., 2017).

The potential to reverse this degradation means that soils represent one of the largest potential terrestrial carbon sinks on Earth. Implemeting improved land management practices can restore a proportion of this lost carbon (Lal et al., 2018). Many studies have sought to assess the carbon sequestration potential of mineral cropland soils through modelling changes in management practices. Optimistic technical estimates for the EU and

UK are as high as 295 Mt CO_{2eq} per year and conservative economic estimates as low as 9 Mt CO_{2eq} (Frank et. al, 2015).

Regenerative agriculture is a conservation and rehabilitation approach to food and farming systems that seeks to focus on the core role of healthy soils (including accumulation of carbon) and farmland ecosystems. There are many different practices which might be considered part of a regenerative farming system which can be explained in 5 broad principles (EEB, 2021):

1. Boosting biological diversity in the soil and farmed landscape
2. Keeping living roots in the soil for as much of the year as possible
3. Keeping the soil surface covered as much as possible
4. Limiting the amount of physical and chemical disturbance of the soil
5. Integrating grazing livestock and organic manures into the system.

Regenerative agriculture as a potential climate mitigation strategy has accelerated interest. Consequenctly, there has been growing investment into developing and implementing regenerative agricultural practices with the view to achieving increased accumulation of carbon in soils, enhance biodiversity and wider soil health criteria as well as generate verified carbon credits.

However, the impacts of such projects are difficult to quantify due to the unique challenges of measuring SOC, which is also inherently time intensive and expensive. This has meant that, to date, there are very few registered projects generating carbon credits through regenerative agricultural practices.

Stakes are extremely high, and there is a pressing need to evaluate emerging crediting frameworks under which projects are developed, including their use of SOC measurement, reporting and verification (MRV) protocols to ensure they result in high-quality credits that identify real net atmospheric carbon sequestered (Oldfield, E.E. et al. 2021). Carbon registries and private companies have developed MRV protocols to bring verified carbon credits to the carbon credit market.

The AgriCaptureCO_2 project seeks to make it easier and more profitable for farmers to adopt regenerative farming practices and generating financial incentives vis-à-vis carbon credits is one means of enhancing progress towards this goal.

2 Legal Frameworks – Context

In compliance markets entities purchase credits that can be used to meet obligations to reduce emissions under:

1 - international schemes, e.g., by countries to meet their NDC under the Paris Agreement or by airline operators to offset emissions under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA); or

2 - national schemes, e.g., by companies to reduce their liability under a domestic emissions trading scheme (ETS).

For the latter, each regulator determines to what extent carbon credits can be used to meet regulatory requirements, and the eligibility criteria for credits:

- They are created by policy makers as a response to limit emissions amid growing climate awareness.
- Emissions reductions are enforced by compliance markets or "Cap and Trade".
- They create a cost for emitting and a financial incentive to reduce emissions (Lockhart et. al., 2022).

2.1 International Carbon Action Partnership

The International Carbon Action Partnership (ICAP) is an international forum for governments and public authorities that have implemented or are planning to implement emissions trading systems (ETS). ICAP facilitates cooperation between countries, sub-national jurisdictions, and supranational institutions that have established or are actively pursuing carbon markets through mandatory cap and trade systems.

To assess the suitability of legal frameworks for use within AgriCaptureCO2, we refer to the ICAP ETS Map. This provides and visualizes up-to-date information on ETS around the world – including systems that are in force, under development and under consideration, these are generally at the country or regional level.

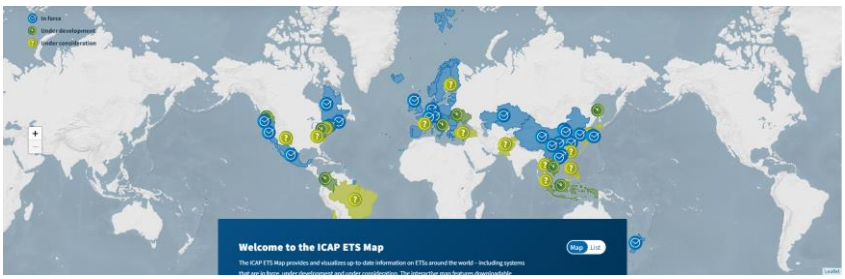

Figure 2: ICAP ETS Map (ICAP, 2022)

Most systems in force focus around the heavy industry, transport and power sectors

- Transport (12)
- Buildings (21)
- Industry (15)
- Power (8)
- Domestic Aviation (2)
- Waste Forestry (1 – Location New Zealand)

Land use and management and soils are not covered under existing or under development / consideration and as such their application for the AgriCaptureCO2 framework are extremely limited.

2.2 European Green Deal: new EU policies towards certification of carbon removals

In December 2019, the European Commission presented its European Green Deal which provides a roadmap with actions to boost the efficient use of resources by moving to a clean, circular economy and stop climate change, revert biodiversity loss and cut pollution.

Full details of this policy context can be found in the following report: AgriCaptureCO2 D2.1: Policy Report EU and UK_V4 FINAL (EEB, 2021).

Two key initiatives are aimed at increasing carbon removals relevant to regenerative agriculture and are particularly pertinent to future frameworks that could be administered for certification of carbon removals.

First, the "carbon farming initiative" announced in the F2F Strategy, aims to promote "carbon sequestration by farmers and foresters" as a new "green business model" that will be financed through the CAP and from private sources.

The European Commission is also developing a regulatory framework for the certification of carbon removal. The purpose of this certification framework is unclear at this point and could range from simply certifying removals for national inventories, to setting rules for the integration of land-based carbon credits in a compliance market.

The strategies for implementation of these such frameworks and initiatives that could be used to support AgriCaptureCO_2 projects in the future are still being defined, after which their uptake and implementation will take some time. For each, strong links with payment agencies will be required, and will be continually explored as part of the overall strategy.

3 Voluntary Frameworks – Context

Voluntary Carbon Market (VCM) are created by financial institutions, governments, and non-governmental organizations. They enable companies and other organisations to purchase carbon credits to support voluntary claims (e.g., net-zero pledges) and certifications.

Overall, VCMs provide an instrument to raise critical finance for climate mitigation actions, nature protection and restoration at speed and scale. They can channel significant private sector finance into economies with high nature-based climate mitigation potential (most notably in low- and middle-income countries), as well as into other cost-effective mitigation options (Lockhart et. al., 2022).

The voluntary carbon marketplace encompasses all transactions of carbon offsets that are not purchased with the intention to surrender into an active regulated carbon market. This includes offsets that are purchased with the intent to re-sell or retire to meet carbon neutrality or other environmental claims.

At present, there is no unified international regulation or guidance on the quality of carbon credits that can be used in the VCM. Albeit several taskforces and advisory boards have been set up with the objective of bridging the gaps, inconsistencies and standardization that exist between current VCM frameworks. Such boards include but are not limited to; Advisory Board of the Taskforce for Scaling Voluntary Carbon Markets, The Voluntary Carbon Markets Integrity Initiative, and The Carbon Credit Quality Initiative.

However, carbon offset credits are not a simple commodity and assessing the quality of carbon credits is both a key objective and a common challenge. The rules and governance arrangements of carbon credit programmes differ widely, including as they relate to common challenges and pitfalls that are discussed within the next pages.

Voluntary Carbon Markets are at an inflection point and this market transition is focused on both transparency and integrity is essential in eliminating the risk in the market undermining the delivery of the Paris Agreement (VCMI, 2022).

Voluntary Frameworks – Examples

Carbon credit frameworks and their associated protocols set out the detailed procedures for qualifying and quantifying the impact of carbon credit projects. These provide guidance to project developers about how to determine project boundaries, set baselines, assess additionality, and ultimately quantify the GHG emissions that were reduced or removed. Within each framework structural considerations address whether projects are VALID. There are a number of well-established frameworks including but not limited to the following:

Clean Development Mechanism (CDM): The CDM allows emission-reduction projects in a defined set of developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO_2. These CERs can be traded and sold and used by industrialised countries to a meet a part of their emission reduction targets under the Paris Agreement. The mechanism seeks to stimulate sustainable development and emission reductions, while giving industrialised countries some flexibility in how they meet their emission reduction limitation targets. There are a total of 3,389 CDM project activities that have issued CERs to date (CDM, 2022).

VERRR: Verra was founded in 2007 by environmental and business leaders who saw the need for greater quality assurance in voluntary carbon markets. The Verified Carbon Standard Programme (VCS) allows certified projects to turn their GHG emission reductions and removals into tradable carbon credits. Since its launch in 2006, the VCS Programme has grown into the world's largest voluntary GHG program. VCS projects include dozens of technologies and measures which result in GHG emission reductions and removals, including forest and wetland conservation and restoration, and agricultural land management. There are currently almost 1,600 registered projects in over 82 countries that have generated more than 450 million carbon credits (VERRA, 2022).

Gold Standard: Gold Standard was established in 2003 by WWF and other international NGOs to ensure projects that reduced carbon emissions featured the highest levels of environmental integrity and also contributed to sustainable development. With the adoption of the Paris Climate Agreement and the Sustainable Development Goals, they launched the best practice standard for climate and sustainable development interventions, Gold Standard for the Global Goals, to maximise impact, creating value for people around the world and the planet. There are currently almost 2,300 registered projects in over 98 countries that have generated more than 191 million carbon credits and 28 billion dollars of shared value created (Gold Standard, 2022).

PLAN VIVO: The Plan Vivo Standard is a set of requirements used to certify smallholder and community projects based on their climate, livelihoods and environmental benefits. It

is the longest-standing carbon Standard in the Voluntary Carbon Market and has gone through a 25+ year evolution, looking back on extensive and rich experience of working with smallholder and community-led restoration and forest protection projects. The Standard had its origins in 1994 in a project in Chiapas, Mexico which sought to incentivise and compensate smallholder reforestation. Over the last 26 years, the Standard has developed into a tried-and-tested model that has been applied by 27 projects in over 20 countries

Climate Action Reserve: CAR are the key carbon offset registry for the North American carbon market, encouraging action to reduce greenhouse gas (GHG) emissions by ensuring the environmental integrity and financial benefit of emissions reduction projects (CAR, 2022)

American Carbon Registry: The ACR was founded in 1996 as a non-profit enterprise and first private voluntary GHG registry in the world. The ACR is an approved offset project registry issuing Registry Offset Credits (ROCs) and Early Action Offset Credits (EAOCs) for the California Cap-and-Trade program. Both offset types can be converted to ARB compliance offset credits. In the voluntary market, the ACR oversees the registration and independent verification of projects that meet ACR standards and methodologies (ACR, 2022).

Emissions Reduction Fund and Carbon Farming Initiative (Australia): Under the Emissions Reduction Fund (ERF), created in 2014, Australia's Clean Energy Regulator can purchase offsets from the land-use (the Carbon Farming Initiative, CFI) and industrial sectors. The Clean Energy Regulator sets a benchmark price for each auction; all bids up to 25% of the volume offered under the benchmark price are accepted. Project developers can apply for Australian Carbon Credit Units (ACCUs). The ERF operates as a competitive reverse auction mechanism, with confidential bids submitted to the Regulator, accepted subject to clearing rules (ERF, 2022).

4 Voluntary Frameworks – Risks and Challenges

Certified soil carbon sequestration projects are rare to find - partly due to risks that are common across multiple carbon credit frameworks, partly related to the risks associated with MRV of soil carbon sequestration. These are identified and addressed within this report with the view to informing users about common gaps and pitfalls, how frameworks can address these and where they don't – recommendations on a best practice blueprint to enhance integrity.

The risks and opportunities of carbon sequestration projects is a hot topic across multiple stakeholders – AgriCaptureCO$_2$ partners have already assessed common shortfalls, opportunities and recommendations for building integrity into carbon markets, all of which have been considered in preparing this report:

- Carbon Dioxide Removal in the EU: Pitfalls and Opportunities (Carbon Market Watch, 2021)
- AgriCaptureCO$_2$ D2.1: Policy Report EU and UK_V4 FINAL (EEB, 2021)
- Certification of Carbon Removals_v2022.1 (Arthurs Legal, 2021)

More specifically relating to the risks and opportunities as they relate to MRV of soil carbon sequestration projects, this link provides a useful insight, the findings of which have been considered in preparing this report:

- Agricultural Soil Carbon Credits: Making sense of protocols for carbon sequestration and net greenhouse gas removals (Oldfield, E.E. et al. 2021)

There is no unified international regulation or guidance on the quality of carbon credits and how to address common risks and pitfalls. Albeit several taskforces and advisory boards have been set up with the objective of bridging the gaps existing in current VCM frameworks, such boards include but are not limited to:

- International Carbon Reduction & Offset Alliance (ICROA)
- Advisory Board of the Taskforce for Scaling Voluntary Carbon Markets
- The Voluntary Carbon Markets Integrity Initiative,
- The Carbon Credit Quality Initiative

WWF, EDF and the Oeko-Institut, have derived a 'Methodology for Assessing the Quality of Carbon Credits' to support decision making and that can also be used to inform the development of VCMs (WWF, EDF, Oeko-Institut, 2021).

Following the increased interest in VCMs and the potential for regenerative agriculture to sequester carbon and generate carbon credits, a consensus has emerged about the common shortfalls and opportunities:

1. Disincentivizing deep carbon reductions required to meet 1.5°C Pathway
2. Safeguards for integrity, environmental protection, soil health, biodiversity and social risks
3. Measurement and uncertainty: baselines, monitoring, reporting and verification (MRV)
4. Risk of reversal
5. Lack of permanence of storage
6. Risk of leakage
7. Demonstrating additionality
8. Double counting, "double claiming" and tracking credits

Some further detail about each risk is shared in the following pages. Table 1 and Table 2 in the next chapter present how these risks are considered within different crediting frameworks.

4.1 Disincentivizing Deep Carbon Reductions Required to Meet 1.5°C Pathway

Current national pledges under the Paris Agreement are insufficient to limit global warming to within a 1.5°C above the pre-industrial averages with no or limited overshoot, and would require an abrupt acceleration of mitigation efforts after 2030 to limit global warming to under 2°C above the pre-industrial averages (IPCC AR6 WG3, 2022).

It is commonly understood that the overreliance of carbon credits to meet global targets could lead to 'greenwashing' through providing a 'quicker and cheaper' solution to embedding real and aggressive decarbonisation required to meet our Paris Agreement commitments.

The term 'Net Zero' has catapulted organisations to accelerate their voluntary climate action. However, stakeholders have expressed concern about the lack of clarity of those commitments due to inconsistencies in their scope, calculation methodology, the depth and speed at which emissions are reduced, communication statements, as well as different approaches to the use of carbon credits. These differences could be, in part, due to there

being no widely agreed-upon definition of net zero at the corporate entity level as well as to what extent carbon credits can be used to achieve net zero targets.

The IPCC defines net zero as: the point when "anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period". The Paris Agreement sets out the need to achieve this balance by the second half of this century.

Perhaps the most important part of net-zero, however, is that it requires significant emissions reductions: 90-95% by 2050. The remaining 5-10% should then be removed through carbon offsetting projects. In practice, this means first prioritising and demonstrating emission reductions across Scopes 1, 2, and 3 sources in line with limiting global warming to 1.5˚C compared to pre-industrial levels and reaching 'net zero' by 2050 or earlier. Achieving this requires emission reduction cuts now, with companies expected to halve emissions by 2030. The result - by 2050 companies will produce close to zero emissions and will offset the remaining amount with high quality carbon removals of no more than 5-10%.

However, many still view the use of carbon credits in the 'traditional' offsetting context. Offsetting properly took off with the Kyoto Protocol's flexible mechanisms, e.g., CDM, which registered its first project in 2004. Compliance carbon markets that included the use of "offsets" were, to different degrees, developed at the regional level – with the EU Emissions Trading Scheme – as well as at national and subnational levels, such as in Canada and California, during the 2000s. In parallel, VCMs grew at a slower pace and different private carbon standards emerged in the 2000s – such as the Climate Action Reserve, the Gold Standard, the Verified Carbon Standard, and the American Carbon Registry.

In Voluntary Carbon Markets, offsetting has been used to claim carbon neutrality for a particular year of operation, event, or product to cover the measured emissions – previously, but not always, limited to Scope 1-2 and partial Scope 3[1] activities over which an organisation has most control. The use of carbon credits has historically not been (or required to be) intrinsically linked with deep decarbonisation that we now know is required with the emergence of global net zero targets if we are to maintain global temperature to safe levels.

Concerns exist that simply counterbalancing emissions disincentivises emission reductions within corporate boundaries. Without stricter rule about their use, carbon credits could

[1] Scope 1: Direct Emissions | Scope 2: Energy Indirect Emissions | Scope 3: Other Indirect Emissions (GHGP)

turn into a much cheaper way for companies to meet carbon neutrality and claim net zero but delay their own GHG reductions. However, by definition, carbon neutrality and net zero are not the same and as such companies cannot claim to be on a pathway to net zero unless they have and are achieving a clear and aggressive decarbonisation pathway.

Furthermore, an overreliance on carbon offsets creates multiple problems with regards to pressures on land use, equity, fairness and climate justice.

4.2 Safeguards for Integrity, Environmental Protection, Soil Health, Biodiversity Loss and Social Risks

The climate crisis is inextricably linked to every aspect of modern production and consumption, making it both a development and environmental issue. The climate crisis must therefore be addressed in a way that does not only reduce GHG emissions to net-zero but does so in a way that is widely inclusive and firmly grounded in the respect of human rights, particularly of the most vulnerable populations who are least responsible but most affected by the climate emergency.

Land provides us with functioning ecosystems, oxygen supply, clean air and water, food, ecosystem services, and many other resources. Focusing only on carbon could exclude other environmental dimensions, making it more challenging to integrate biodiversity and wider soil health criteria, which can lead to perverse incentives (e.g., afforestation of high nature value grasslands) or "techno-fixes" rather than holistic change to agroecology or truly regenerative farming (EEB, 2021).

There are also challenges around evaluating all the potential environmental and social impacts that a project may have, understanding the trade-offs between these impacts, assessing the degree of these potential impacts, and then consolidating these impacts into indicators that enable comparisons. This complexity is compounded by the subjective and contextual nature of some of the assessment of these issues. This is one of the reasons why there is such a diversity of frameworks and approaches, including the Universal Declaration of Human Rights, the Sustainable Development Goals (SDGs), the United Nations Development Program's Social and Environmental Standards (UNDP), and the International Finance Corporation's Performance Standards (IFC), among others (WWF, EDF, Oeko-Institut, 2021).

The Agenda 2030 with its SDGs, adopted in 2015 by the United Nations Member States, is a very useful global framework for assessing the sustainable development impact of a project used to generate carbon credits. The SDGs consist of 17 goals with 169 sub-

targets. The SDGs are universal, indivisible, and interlinked, meaning that the achievement of one development goal has impacts on other goals (United Nations, 2022). From the SDG framework perspective, projects in the VCM are mainly about achieving progress on the SDG 13 but with potential co benefits or trade-offs with other SDGs.

Awareness of the trade-off between environmental improvement and social justice is important. Environmental and social safeguards aim to avoid and minimise potential negative impacts of projects in the VCM. Lack of social and environmental safeguards for example with the Clean Development Mechanism (CDM) have been well documented, with the absence of a grievance mechanism cited as a major shortcoming of the system (Carbon Market Watch, 2018).

4.3 Measurement and Uncertainty: Baselines, Monitoring, Reporting & Verification (MRV)

Methodologies set out detailed procedures for quantifying the GHG benefits of a project and provide guidance to help project developers determine project boundaries, set baselines, assess additionality and ultimately quantify the GHG emissions that were reduced or removed. Methodologies relating to regenerative agriculture have emerged in recent years, however to date there are very few registered projects, largely due to the complexities and challenges around their application in a robust and consistent fashion.

A baseline scenario of a project is the business-as-usual scenario that the mitigation activity is compared against. Therefore, the value of carbon removals is always relative to a hypothetical situation in which the carbon reducing activities were not conducted. It is important that this hypothetical situation is realistic, and evidence based. Key risks include, but are not limited to:

- Lack of scientific integrity when creating the baseline,
- Potential perverse incentives not taken into account in determining the baseline, where applicable,
- Lack of consideration of how existing government policies and legal requirements may impact the baseline;
- Lack of consideration of how new government policies and legal requirements, may impact the baseline;
- No consideration of potential rapidly changing circumstances over time;

- Whether mitigation targets and actions in NDCs are considered in determining the emissions baseline;
- Lack of transparency about information related to the determination of the baseline scenario.

Furthermore, SOC content of soils cannot be easily measured – this is a key barrier to implementing programmes to increase SOC at large scale. Key risks include, but are not limited to:

- There is an incomplete understanding about how SOC changes are influenced by climate, land use, management, and edaphic factors (Stockmann et al., 2013), high uncertainty levels in soil carbon models.
- Soil carbon measurements can vary significantly within a parcel and across depth levels.
- The potential reversibility of soil carbon sequestration (intentional and unintentional) increases uncertainty in the time frames needed to monitor SOC enhancement activities (Rumpel et al., 2019).
- The large background stocks, inherent spatial and temporal variability and slow soil C gains make the detection of short - term changes (e.g. 3–5 years) in SOC stocks challenging (Smith et. Al. 2019).
- Accurate MRV of soil carbon sequestration is costly and could add significant administrative burden.
- Unrealistic estimates of efficiencies and removals from projects.

4.4 Third-party Auditing and Verification

Accredited third-party auditors must confirm that a project fulfils all requirements of the crediting program. Following successful auditing, the project documentation and the auditing reports are submitted to the carbon crediting program for final approval, where programmes may apply their own auditor oversight and project quality control measures. A weak auditing system could undermine the thoroughness of scrutiny of third-party auditors and therefore potentially undermine the quality of the carbon credit. In addition, verification costs can be extremely high and could generate considerable burden on the landowners if such costs are not covered by the buyer of the credits.

4.5 Risk of Reversal

Soils are a continuously cycling pool of carbon, with carbon fluxes taking place outwards and inwards. Land management practices do not only influence the pattern and quantity of GHG fluxes, but also the albedo effect which is increasingly known to be significant. The carbon cycle is influenced by and influences the nitrogen cycle, and in some cases increased carbon sequestration is offset by increased nitrous oxide emissions. If regenerative practices are ceased, earlier carbon sequestration can rapidly be reversed (Arthurs Legal, 2021).

Non-permanence relates to reversals of carbon from a carbon sink or "reservoir". It occurs when a mitigation activity enhances or preserves carbon stocks in carbon reservoirs but, at a later point in time, some, or all the additional increments in stock caused by the mitigation activity are released to the atmosphere. Reversals in carbon sequestration can result from a change in land use or management, such as repeated tillage events after no-till, or from uncontrollable climate events, such as droughts, floods and fires (OLDFIELD, E.E et al., 2021).

4.6 Lack of Permanence of Storage

Closely related to the risk of reversal is the risk of permanence - one of the uniquely challenging aspects of soil carbon sequestration is that it is extremely impermanent (Thamo and Pannell, 2016; Ritter and Treakle, 2020). This impermanence poses significant risks to landowners that are contractually obligated to sequester carbon. Permanence is a necessary condition for creditable CO_2 emissions offsets, sequestered carbon must remain sequestered during the period of the offset credits, typically issued for a 100-year period (in newer markets, temporary credits can be issued for periods from 25 years). The United Nations' Intergovernmental Panel on Climate Change defined a 100-year timeframe for monitoring permanence and determining GWP. This could be a significant obstacle for projects, especially if only receiving payments during the first 20-30 years of the project.

There is a risk that is there is no legal liability to maintain the sequestered carbon beyond a soil carbon sequestration contract term. If the contract ends - is the farmer/landowner obligated to maintain the practice or are they free to revert to previous practices without legal liability for re-releasing stored carbon. The climate change mitigation potential of the project could be significantly diminished along with their potential to helping offset

purchasers meet their sustainability goals if there is a lack of permanence (OLDFIELD, E.E et al., 2021).

The question of liability in case soil carbon is re-emitted after a credit is sold is also crucial. It should not be placed solely on farmers, when carbon sequestration is reversed for reasons outside of their control; but if the carbon is lost intentionally or due to negligence, farmers must be accountable (EEB, 2021).

4.7 Risk of Leakage

Leakage occurs when a carbon offset project displaces emission-creating activities to outside the project boundary, rather than halting them in actual terms (Murray et. Al, 2003). Risks include that during the selection of emission sources for calculating emission reductions or removals all major project and leakage emission sources may not be considered and included. There is a common risk of carbon leakage within a farm if the carbon credit project does not cover the entire farm - some carbon farming practices might lead to higher N_2O emissions from soil or CO_2 from machinery, so the entire farm GHG balance must be considered, or across regions, for example if cropland converted to grassland for carbon credits leads to the creation of new cropland elsewhere (EEB, 2021).

4.8 Demonstrating Additionality

Addressing additionality requires proof that project activities would not have occurred without the incentive structure provided by the carbon market. In other words, the ability to sell carbon credits must play a decisive role in the decision to implement the mitigation activity. If a mitigation activity is not additional, purchasing carbon credits from such an activity does not trigger any further emission reductions or removals, and would not offset one's own emissions and as such is an essential criterion for determining carbon credit quality. If a mitigation activity is not additional, the use of climate finance where not truly needed would lead to a poor allocation of resources.

In practice, assessing whether a mitigation activity is additional can be difficult because mitigation activities are implemented for different reasons, they may be required by law or because there is a business case (Schneider, 2009). Assessing additionality requires comparing the mitigation activity to a scenario without the incentives created by the carbon credits. This scenario is hypothetical and must be determined using informed predictions. For this reason, assessment of additionality also faces information asymmetries between a project owner and carbon crediting programs because only the

project owner knows whether the incentives of carbon credits actually determined the implementation of the activity (Broekhoff et al. 2019; Gillenwater 2012; Schneider 2009). Due to these inherent uncertainty's frameworks can generally only provide an assessment of the likelihood of the additionality of a mitigation activity.

In the context of carbon farming, proving additionality can be burdensome to prove for farmers and could disincentivise alternative policy action – e.g., financial additionality may be harder to prove if public funding is available for carbon farming, and the setting of mandatory standards could hinder regulatory additionality.

4.9 Double Counting, "Double Claiming" and Tracking Credits

A carbon credit can only be counted once. Double counting of emission reductions or removals occurs when a single GHG emission reduction or removal is counted more than once towards achieving mitigation targets or goals. Avoiding "double counting" is a widely accepted integrity requirement for VCMs. The assessment of double counting avoidance is generally conducted at the crediting program level, and to come extent, at host country level. Weak transparency and oversight can lead to double counting which can occur in different ways (Silvestrum Climate Associates, 2018):

- **Double issuance**: more than one carbon credit is issued for the same emission reduction or removal. Double issuance leads to double counting if more than one of these carbon credits is counted towards achieving mitigation targets or goals.
- **Double use**: the same carbon credit is counted twice to achieve a climate target or goal. This could occur if the same credit is cancelled twice or if two entities claim emission reductions or removals from the cancellation of one carbon credit.
- **Double claiming**: occurs if the same emission reduction or removal is claimed by a country, jurisdiction or entity that reports lower emission levels to demonstrate achievement of mitigation targets, goals or obligations, as well as by the country or entity using the carbon credit. Double claiming with host country NDCs can occur when there are no corresponding adjustments applied to the emission balances of the host country. It is widely acknowledged that double claiming with host country NDCs can constitute an environmental integrity risk and, in the longer term, corresponding adjustments should be applied, progress towards the implementation of Article 6 rules seeks to minimise and mitigate this risk.

5 Carbon Crediting Frameworks – Best Practice Blueprint

There is consensus across AgriCaptureCO2 partners and the broader research community about the key risks that any framework applied under AgriCaptureCO2 must address and indeed mitigate.

Mitigating these risks will deliver real and high-quality carbon removals that are captured and stored permanently over several centuries with all related emissions being considered and other impacts being accounted for including environmental, biodiversity and social priorities:

1. Disincentivizing deep carbon reductions required to meet 1.5°C Pathway
2. Safeguards for integrity, environmental protection, soil health, biodiversity and social risks
3. Measurement and uncertainty: baselines, monitoring, reporting and verification (MRV)
4. Risk of reversal
5. Lack of permanence of storage
6. Risk of leakage
7. Demonstrating additionality
8. Double counting, "double claiming" and tracking credits

Voluntary frameworks and their associated methodologies and protocols and how they deal with these risks and therefore meet the AgriCaptureCO2 Best Practice Blueprint are not consistent.

The tables in this chapter show how these risks (and some others) are dealt with by the key design elements and principles of key carbon crediting frameworks.

5.1 Crediting Frameworks – Assessment Against Best Practice Blueprint

Nearly all assessed crediting frameworks have strict requirements to cover the key risk areas identified in our assessment:

1) Disincentivizing deep carbon reductions required to meet 1.5°C pathway
2) Safeguards for integrity, environmental protection, soil health, biodiversity loss and social risks
3) Measurement and uncertainty: baselines, monitoring, reporting and verification (MRV) (a deeper dive is presented in Table 2)
8) Double counting, "double claiming" and tracking credits

Specifically, VERRA, Gold Standard and Plan Vivo meet all the key common pitfalls with a gap existing in 2 key areas:

- How frameworks incentivise deep carbon reductions required to meet 1.5°C pathway AND
- Ensuring no double counting, "double claiming" and tracking credit.

Please note, several frameworks can prevent double issuance and use but due to the lack of international agreement on accounting rules, process to ensure avoidance of double claiming are still in development.

Key Risk Criteria	Clean Development Mechanism	Verra	Gold Standard	American Carbon Registry	Joint Crediting Mechanism	Climate Action Reserve	Plan Vivo
Location Coverage	Developing Countries	International	International	United States, Some International	Developing Countries	United States, Mexico	International
Clear Methodologies, Protocols & Development Process Baselines, Monitoring, Reporting and Verification (MRV)	✓	✓	✓	✓	✓	✓	✓
Regenerative Agriculture Related Methodology	×	✓	✓	×	×	✓	✓
Safeguards for Integrity, Environmental Protection, Biodiversity Loss, and Social Risks	×	✓	✓	✓	×	×	✓
Requirement to Report on UN SDG Benefits	×	✓	✓	×	×	×	✓
Avoidance of Double Counting, Issuance & Claiming	×	×	×	×	×	×	×
Disincentivizing Deep Carbon Reductions Required to Meet 1.5°C Pathway	×	×	×	×	×	×	×
Offset Credit Issuance and Retirement Procedures	✓	✓	✓	✓	✓	✓	✓
Identification and Tracking	✓	✓	✓	✓	✓	✓	✓
Transparency and Public Participation Provisions	✓	✓	✓	✓	✓	×	✓
Program Governance	✓	✓	✓	✓	✓	×	Unclear

Table 1 Crediting Frameworks – Assessment of Risk Mitigation (Carbon Market Watch, 2019)

The following table presents a deeper dive review of how the specific protocols enable frameworks to mitigate risks as they apply to regenerative agriculture projects:

4) Risk of reversal
5) Lack of permanence of storage
6) Risk of leakage
7) Demonstrating additionality

As we see in the table below, we see how a sample of frameworks all generally have measures in place to address the risks commonly cited by stakeholders, this is achieve through applying different thresholds - these differences mean that credits derived from different protocols are not equivalent, a significant obstacle when applying these credits to NDCs or offsetting as part of a Net Zero reduction strategy.

Criteria	Additionality	Permanence	Reversals	Leakage	Consideration of other GHGs (e.g. Nitrous Oxide and Methane)
Climate Action Reserve Soil Enrichment Protocol v 1.0	Yes, performance standard test and legal requirement test	Yes, commitment of 100 years or tonne year Accounting where credits are issued as a proportion of 100-year permanence period	A percentage of credits go to a buffer pool	Yes, accounts for leakage related to displacement of livestock and sustained reductions in crop yields	Yes, net emissions accounted for through use of modelling or emissions factors
Verra VM0042 Methodology for Improved Agricultural Land Management, v 1.01	Yes, identification of barriers preventing project activities, legal requirement and performance standard test	Yes, 30 years, with risk of non-permanence calculated using the VCS AFOLU Non-Permanence Risk Tool	Yes, a percentage of credits go to a buffer pool	Yes, accounts for application of manure from outside project area, sustained reductions in crop yields and	Yes, net emissions accounted for through use of modelling or emissions factors

				livestock displacement	
Verra VM0017 Adoption of Sustainable Land Management (SALM), v 1.01 (Small Holders)	Yes, must use additionality tool for Clean Development Mechanism project activities	Yes, 30 years, with risk of non-permanence calculated using the VCS AFOLU Non-Permanence Risk Tool	Yes, a percentage of credits go to a buffer pool	Yes, accounts for use of fuel from non-renewable sources due to decrease in use of manure that may be transferred to fields through project activities.	Yes, net emissions accounted for using emissions factors.
Verra VM0021 Soil Carbon Quantification Methodology, v 1.0	Yes, must use additionality tool for Clean Development Mechanism project activities	Yes, 30 years, with risk of non-permanence calculated using the VCS AFOLU Non-Permanence Risk Tool	Yes, a percentage of credits go to a buffer pool	Yes, accounts of livestock Displacement and sustained reductions in crop yields	Yes, emissions factors applied if project activities result in emissions >5% of baseline
Gold Standard Soil Organic Carbon Framework Methodology v 1.0	Yes, performance standard test and legal requirement test	Permanence required within crediting period (depending on SOC Activity Module, 5-20 years).	Yes, a percentage of credits go to a buffer pool	Yes, accounts for shifting crop production	Yes, modelling or emissions factors applied if project activities result in emissions >5% of baseline
Nori Croplands Methodology, v 1.1 Yes, project	Yes, project activities must show improvement in carbon sequestration over baseline scenario	10 years	Yes, restricted tokens are used to account for any deliberate reversals	Verification will establish if SOC stock gains result in losses outside of project boundary	No

Carbon Credits (Carbon Farming Initiative — Measurement of Soil Carbon Sequestration in Agricultural Systems) Methodology	Yes, a "newness" test that requires at least one new management activity	100 or 25 years; if projects opt for 25, then 20% of credits will be deducted	Yes, a percentage of credits go to a buffer pool	Yes, accounts for application of amendments outside of project area	Yes, emissions factors are used if project emissions are greater than those of baseline
Carbon Credits (Carbon Farming Initiative — Estimating Sequestration of Carbon in Soil Using Default Values) Methodology	Yes, a "newness" test that requires at least one new management activity and will result in expected changes	100 or 25 years; if projects opt for 25, then 20% of credits will be deducted	Yes, a discount rate on sequestration is applied if a "depletion event" has taken place	Yes, accounts for leakage resulting from new irrigation (if using new water access entitlement or irrigation right)	Yes, net abatement is calculated through the FullCAM model
Alberta Quantification Protocol for Conservation Cropping, v 1.0	Yes, eligible project must be new and additional to business as usual; sequestration coefficient discounted according to observed rate of increase in adoption of no-till	20 years	Yes, each offset is discounted by a percentage specific to the region containing project	Based on ISO 14064:2 — activity shifts deemed minimal	Yes, regionally based emissions factors built into sequestration coefficients
FAO GSOC MRV Protocol	Yes, project must show improvement over baseline in sequestration by performing a 20-year SOC simulation	Projects are planned for a 4-year duration and can be renewed for another 4 years.	Yes, a 5% risk of reversal discount will be applied to sequestration projects	Potential sources of leakage defined during the initial project assessment	Yes, net emissions accounted for through use of modelling or emissions factors

BCarbon	Issued credits will be for carbon added to the ground after initiation of testing	10 years, which is renewable each subsequent year when new credits are issued.	10% of credits go to a buffer pool.	Potential sources of leakage will be assessed by LCA.	No
Regen Network Grasslands Protocol	Yes, eligible project must implement practices new and additional to business as usual	25 years	Yes, a percentage of credits go to a buffer pool	Potential sources of leakage tracked over time	Yes, net emissions accounted for using IPCC or relevant national/state/regional factors

Table 2 Crediting Framework Protocols – Assessment of Risk Mitigation (OLDFIELD, E.E ET. AL, 2021)

6 Enabling a Best Practice Blueprint Framework

Table 1 and Table 2 demonstrate that both VERRA and Gold Standard score highest when assessing both framework design elements and structural accounting issues.

Both frameworks are globally recognised as delivering projects that are validated, verified and registered, in accordance with international best practice and demonstrate a VALID approach:

- **V**erifiable,
- **A**dditional to what would have happened,
- free from **L**eakage of emissions elsewhere,
- **I**rreversible and
- are not **D**ouble counted.

Each have MRV protocols to support regenerative practices, albeit that each have different specifications around their approaches to baseline validation, modelling, sampling, and allowable uncertainty:

- <15% VERRA
- <20% Gold Standard.

Each stipulate that practices impacting SOC storage must not already being implemented on a defined percentage of land area containing a project

- >20% VERRA
- >5%Gold Standard.

Each allow a 'lookback period' to enable generation of carbon credits for projects implemented in the past:

- 5-year VERRA
- 3 years Gold Standard.

Both set out methodologies to support the development of several regenerative agriculture practices:

- Verra VM0042 Methodology for Improved Agricultural Land Management
- Gold Standard Soil Organic Carbon Framework Methodology v 1.0

The VERRA methodology aligns more closely with the suite of AgriCaptureCO_2 regenerative practices and allows for the impact of a combination or group of practices to be included within a project.

Both have clear measures in place to address double-counting issue through a dedicated registry, in which each carbon credit has a unique serial number and can only be held in individual accounts Each are also strengthening their standards considering the Paris Rulebook outcomes of COP26.

Overall, VERRA presents fewer barriers to project implementation and less-stringent additionality requirements making the use of this framework and associated methodology more appropriate for use under the AgriCaptureCO$_2$ framework.

In the next pages we set out how each risk will be dealt with, through the application of the selected VERRA framework and methodology and supplemented by other actions to enable the realisation of the developed Best Practice Blueprint. These other actions are summarised at the end of each subsection under "**Additional requirements**", as relevant.

The result is the opportunity to build integrity, improve confidence, increase scalability and help ensure net environmental benefits for the development of carbon credits under AgriCaptureCO$_2$ and other projects.

OCW are developing the 1st agricultural carbon credit project in Europe submitted under VERRA to test the selected framework and supplementary actions. We will use lessons learned to further improve the AgriCaptureCO$_2$ platform and project development.

6.1 Disincentivizing Deep Carbon Reductions Required to Meet 1.5°C Pathway

Studies have shown that companies that offset (e.g., amongst CDP respondents) are also those who do more to reduce their own emissions. They are companies conscious of their emissions and more often carbon credits are purchased as a part of a larger carbon strategy for emissions reduction.

Principles for the use of carbon credits would help ensure that carbon offsetting does not preclude other efforts to mitigate emissions and does result in more carbon reductions than would take place otherwise. Under such principles, a company would first establish its need for carbon credits by disclosing its greenhouse-gas emissions from operations, along with targets and plans for reducing emissions over time (Ecosystem Marketplace, 2022).

Under the existing model deployed by OCW – before selling carbon credits to companies, interested companies must first demonstrate reduction in their own emissions – enhance their adoption of low, zero or negative emissions technologies and practices – and measure the impact of these actions. This ensures that offsets are sold to like-minded organisations that are part of recognised net zero aligned frameworks, these could include but are not limited to:

- Science Based Target Initiative (SBTi)
- United Nations Climate Neutral Now Initiative (UNCNNow)
- Carbon Disclosure Project (CDP)
- PAS 2060
- ISO14068 (in development)

This approach will ensure we provide assurance that projects developed under the AgriCaptureCO2 framework demonstrate that they are part of a 'Net Zero Transition' Carbon Offsetting Model.

Additional Requirement: Company alignment to a net zero aligned reporting framework.

This approach is being tested for integrity as part of OCW's research into exploiting AgriCaptureCO2 results as part of the Great British Sustainable Farming Programme (GBSF).

6.2 Safeguards for Integrity, Environmental Protection, Soil Health, Biodiversity Loss and Social Risks

It is recommended that projects have mandatory inclusion of indicators for environmental benefits other than climate mitigation (biodiversity, soil health, water quality, farm resilience). This contributes to enhancing adaptation and resilience, and supports those most vulnerable, frontline communities (Oldfield, E.E et al., 2021).

Projects will not only be verified by VERRA but also the VERRA-managed Climate, Community and Biodiversity Standard. This is a qualitative standard designed to measure and report wider project benefits beyond emission reductions, specifically they ensure creation of net-positive benefits for climate change mitigation, local communities, and biodiversity. The CCB Program can be used in conjunction with a GHG-crediting program,

such as VERRA, and carbon credits can be labelled with the co-benefits certified under the CCB Program, e.g.:

1. make a significant contribution to combating climate change
2. improve livelihoods
3. create employment
4. protect traditional cultures
5. help secure tenure to lands and resources
6. protect biodiversity-rich primary forest and endangered species
7. safeguard ecosystem services such as mitigating flooding, reducing soil erosion and water conservation.

Projects verified to the CCB standard may achieve Gold level recognition to exceptional performance in the areas of Adaptation, Biodiversity, and Community engagement.

Additional Requirement: Climate, Community & Biodiversity (CCB) Standards.

This approach is being tested for integrity as part of OCW's research (GBSF).

6.3 Measurement and Uncertainty: Baselines, Monitoring, Reporting and Verification (MRV)

Under AgriCaptureCO$_2$ we will apply the VERRA methodology for Improved Agricultural Land Management (VM0042). This methodology was published in November 2020. Making use of AgriCaptureCO$_2$ project results, OCW is developing a UK-based carbon credit project with the aim of testing the robustness of its approaches to MRV.

We recognise the challenge of MRV related to the certification of carbon removals. AgriCaptureCO$_2$ is working on an advanced data-driven monitoring infrastructure in the agricultural sector.

With the collection and analysis of soil samples, Earth Observation data and satellite images in particular, AgriCaptureCO$_2$ aims to map and monitor the quality of the soil over time through detecting and monitoring the application of regenerative agricultural management which promote SOC and soil health in general (Arthurs Legal, 2021).

The digital measurement infrastructure enables stakeholders to monitor, measure and evaluate soil quality and SOC over time and on different scales supported by ground truth data. This also offers the opportunity to provide evidence for the additionality of carbon removals. For example, it allows users to demonstrate the difference compared to the

situation in which the additional carbon removals were not applied. This could potentially offer a solution for upscaling carbon removals whilst building capacity of accurate measurement and monitoring. In this respect, Earth Observation data are a robust and objective source of information allowing continuous and consistent monitoring over time and over large areas. Once validated with in-situ measurements, this technology can be used to reduce the efforts for the costly verification on the ground and hence allows covering bigger areas. Copernicus data must be at the centre of these efforts but need to be complemented by commercial datasets which are essential to enhance the frequency (temporal resolution) and detail (spatial and spectral resolution) of these datasets (Arthurs Legal, 2021).

AgriCaptureCO_2 is working together with farmers, landowners, farmer groups, agri-businesses and other stakeholders in the agricultural value chain to enrich available datasets and improve service accuracy/value. As well as fully leveraging data from the EU's Copernicus programme combined synergistically with higher resolution data from our consortium partner, Planet. Based on our experience in technical development, this holistic approach to engaging and including stakeholders as a key element of the process is required to ensure a high-quality monitoring, verification and reporting system. In turn, this approach requires "buy-in", benefits and effective data governance systems to ensure fair play and the required level of stakeholder contributions (Arthurs Legal, 2021).

There is the need to evaluate MRV costs against the value of soil C sequestered (Mäkipää et al., 2008; Smith, 2004b) and be aware of the trade - offs between costs involved and alternative SOC estimation methods including different modelling approaches while remaining in line with framework protocols. Grouping together multiple farm-scale projects, known as aggregation, will help reduce transaction costs associated with MRV.

Additional Requirement: Application of approved MRV platform, costs added to the price of the credit.

This approach is being tested for integrity as part of our research (GBSF)

6.4 Risk of Reversal

Dealing with risks of reversal are dealt with under the VM0042: Improved Agricultural Land Management methodology and refers specifically to the requirement of following the 'VCS Registration and Issuance Process for loss or reversal events.

This requires that a certain percentage of credits go into buffer pools to account for the risk of both unavoidable and avoidable reversal. If an avoidable reversal occurs, the project owner must relinquish a quantity of credits equal to the size of the avoidable reversal, or payments cease until the loss of SOC is accounted for.

Further research could include the assessment of the appropriate scale of aggregation and level of buffer accounting (e.g., is it based on agro-ecological and biophysically defined regions and socio-economic attributes).

This approach is being tested for integrity as part of our research (GBSF)

6.5 Lack of Permanence of Storage

Assessing the significance of non-permanence risk is dealt with under the VM0042: Improved Agricultural Land Management methodology using the VCS AFOLU Non-Permanence Risk Tool. Further inclusions could include 'Guarantee of Permanence' (within Land Manager's Control) and buffers for natural variation in carbon fluxes.

This approach is being tested for integrity as part of our research (GBSF)

6.6 Risk of Leakage

Risks of leakage are dealt with under the VM0042: Improved Agricultural Land Management methodology which accounts for application of manure from outside project area, sustained reductions in crop yields and livestock displacement.

This approach is being tested for integrity as part of our research (GBSF)

6.7 Demonstrating Additionality

Requirements for demonstrating additionality are dealt with under the VM0042: Improved Agricultural Land Management methodology which presents an objective metric for demonstrating additionality that is transparent and unambiguous. The project proponent must demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the VCS Methodology Requirements.

In addition to the demonstration of regulatory surplus, projects must:

1. Identify barriers that would prevent implementation of a change in pre-existing agricultural practices; and,

2. Demonstrate that the adoption of the suite of proposed project activities is not common practice (VM0042).

This requires project activities to show that practices impacting SOC storage are not already being implemented on a defined percentage of land area containing a project >20% for Verra compared with >5% for Gold Standard).

Encouraging early adopters to continue beneficial practices while also ensuring any credits are truly additional is a challenge. VERRA allows for back payments, so farmers can accumulate credits for practices undertaken over the past five years.

Less-stringent additionality requirements could help ensure that these early adopters do not abandon their practices to re-adopt later for eligibility in the market.

This approach is being tested for integrity as part of our research (GBSF)

6.8 Double Counting, "Double Claiming" and Tracking Credits

This accounting problem is yet to be resolved at the international level, as countries are currently negotiating the accounting rules of international carbon markets following COP26.

Alignment with The Paris Rule Book - Article 6

Article 6 of the Paris Agreement has made it possible for countries to purchase emissions reduction abroad and use this towards their own targets. The framework for this took 6 years of negotiations and was finally agreed on at COP26 in Glasgow. The text sets a framework to ensure any emissions reduction units generated by projects abroad may only be used towards a country's NDC's with corresponding adjustments in place.

This means that when an emissions reduction unit is sold abroad, the projects host country must cancel out the impact on its own carbon inventories accordingly to mirror the transfer. The outcome ensures avoidance of one emissions reduction unit being counted by two countries. Practically, it means that only credits which are adjusted for under Article 6 can be used towards another country's NDC, which guarantees credibility.

Article 6.2 provides an accounting framework for international cooperation, such as linking the Emissions Trading Systems of two or more countries. It also allows for the bilateral transfer of carbon credits between countries and other entities (so-called Internationally Transferred Mitigation Outcomes, 'ITMO').

Article 6.4 establishes a centralised UN mechanism (successor of the Clean Development Mechanism from the Kyoto Protocol) to certify tradable credits from emissions reductions generated through offset projects (ING, 2022).

VERRA has sufficient rules in place to prevent double issuance and double use and are in the process of developing guidance for the avoidance of double claiming. However, programs are limited in their ability to do so by the lack of an international agreement on accounting rules.

Additional Requirement: Apply and obtain letter of authorisation by the host country.

This approach is being tested for integrity as part of our research (GBSF)

7 Prioritising Carbon Insetting

Recommendations within this report go some way towards mitigation of identified risks. However, there will inherently be a level of reversal/non-permeance risk as well as uncertainties linked with detecting carbon stock change over time.

The term carbon "insetting" has been used to refer to a company's efforts to prevent, reduce, or remove emissions within its own supply chain. Insetting presents a significant opportunity to reduce/remove the risks and uncertainties identified within this assessment. Therefore, it is recommended that organisations with agricultural supply chains should prioritise GHG mitigation through SOC sequestration as part of an insetting strategy to manage emissions across their supply chain. Internalising these efforts ensures the entity seeking to reduce its emissions is actively engaged in collaboratively providing education, technical assistance, and in many cases financial assistance. The measurement of reductions and resulting carbon balance should follow approved standards (Oldfield, E.E., et. al, 2021).

There are currently several examples of carbon insetting where companies have directly targeted the agricultural segments of their supply chains for opportunities to sequester carbon through implementation of regenerative practices. Examples of inset markets include initiatives by Nestlé (2021) and Bayer (2021) as well as the efforts of the Field to Market Alliance (2021). Commitments by food and agriculture companies to reduce scope 3[2] emissions from their supply chains can add value by accelerating the adoption of agricultural practices that can have benefits beyond SOC storage, such as increased resilience to climate change impacts.

As with carbon credit certification, there is a need for a robust verification procedure through standards, such as ISO 14064-2, for the verification of carbon emissions and sequestration occurring within a supply chain. This should be carried out by an independent and impartial third party following approved standards.

This approach is being tested for integrity as part of OCW's research (UNCNNow Initiative).

[2] Scope 3 | Other Indirect Emissions across the value chain e.g., out grower farms

8 Conclusions and next steps

Soils contain the largest stock of organic carbon in terrestrial ecosystems: 2,500 billion tons of carbon are stored globally within the first 2 meters of soil, twice the amount of carbon stored in the atmosphere.

As a result, changes in soil carbon stocks may significantly affect the concentration of carbon dioxide in the atmosphere. A 1% increase of topsoil carbon across Europe's agricultural soils would result in the capturing of 6-8 billion tons of carbon from the atmosphere, approximately three times Europe's entire carbon emission within one year.

Companies have made the commitment to net zero aligned climate action and carbon credits will be required to rebalance residual emissions.

Existing carbon crediting frameworks are not standardised and we have identified common risks associated with developing carbon sequestration projects under such frameworks.

We are at a critical point to select the right framework – the stakes are high across our planet. We know that if one project results in negative impacts e.g., if we do not ensure best practice to mitigate the risks, this could lead to a lack of integrity across all projects developed under the applied framework.

There are some standards with similar, high levels of integrity enabling a narrowing down based on these delivering a VALID approach, meaning carbon credits are:

- **V**erifiable,
- **A**dditional compared to what would have happened without the project,
- free from **L**eakage of emissions elsewhere,
- **I**rreversible, and
- are not **D**ouble counted.

VERRA is a globally recognised framework, it was founded in 2007 by environmental and business leaders who saw the need for greater quality assurance in voluntary carbon markets and demonstrates applicability to AgriCaptureCO_2:

- Compatible with nature-based projects – specifically improved agricultural land management, closely aligned with the regenerative agriculture.
- Presents measures to mitigate most of the risks highlighted by the AgriCaptureCO_2 consortium members and reflected in our broader research.

- Allows national project scope – once the project is designed and verified, other project instances can join, significantly reducing complexities, resource and costs and enhancing consistency across project design parameters and project MRV.
- Reduced barriers such as demonstration of additionality compared to others.

We understand that ensuring clear environmental, social and biodiversity safeguards is a key opportunity to enhance integrity. VERRA presents a clear integrity enhancement pathway on this subject via application of the Climate, Community & Biodiversity (CCB) Standards (VERRA). There are only 200 projects (VERRA, 2022) aligned with this standard in the world and would therefore springboard projects into a different class of best practice.

Auditors only attend every several years and may not have attended prior to project implementation – resulting in transparency gaps. We will apply best practice EO driven MRV to support evidence needed for outcomes to match expectations, with costs being covered in the price of the credit if appropriate. This is compatible with VERRA in 3 ways:

- Demonstrate eligibility (e.g., no land use change)
- Demonstrate implementation of a regenerative practice
- Enhance the practice to support farmers achieving the 1% increase in the topsoil of carbon that will result in rebalancing 3 x Europe's emissions.

Finally, we recommend that remaining risks identified in this report are mitigated via other elements of our "Best Practice Blueprint" as follows:

- Application of approved, best practice EO driven MRV platform with
- Apply and obtain letter of authorisation by the host country – ensuring a commitment to apply corresponding NDC adjustments following generation of carbon credits for the VCM, ensuring unique ownership and assurance for buyers.
- Alignment with other requirements of Article 6 as they emerge.
- Buyer alignment to a net zero aligned reporting framework (e.g., UNCNNOW).

Next Steps

The application of VERRA in tandem with the "Best Practice Blueprint" actions identified in this report are being tested for integrity as part of OCW's research (GBSF). Significant progress has already been made with the registration of the first VERRA project in Europe, testing of the measures set out in the report will be continued so that we can quantify the outcomes of their application.

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