TOWARDS A CARBON CREDIT & BLUE CREDIT SCHEME FOR PEATLANDS

WHITE PAPER

PHOTO BY CHRISTOF VAN ACKERE, NATUURPUNT (INTERREG CARE-PEAT)

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Contents

1. Scope

The aim of this document is to outline the preliminary requirements and steps needed to fully establish frameworks for certification systems across Europe, specifically to support and incentivize the restoration of peatlands and to provide a framework for reducing GHG emissions from degraded and mismanaged peatlands on a large scale. This will ensure that peatlands across Europe fulfil their potential to become a net carbon sink by 2050, while optimizing ecosystem service provision in a way that is fully consistent with all the relevant European policies.

This report covers the following topics:

- Analysis of current Carbon Credit systems and other incentives to support wet peatlands.
- Economic land use analysis relating to peatlands.
- Outline of a framework to support rewetting and peatland restoration.
- Recommendations for an Eco-Credit system across Europe.

In June 2021, EC Executive Vice-President for the European Green Deal Frans Timmermans said: "Our climate action must first and foremost reduce human-made emissions. But we also need to restore and protect natural carbon sinks, so that we can capture CO_2 from the atmosphere and store it in our soils and forests. Carbon farming offers new income opportunities for farmers. It is an example of how the new Common Agricultural Policy's eco schemes and private funding can reward agricultural practices that help us fight the climate and biodiversity crises." [1]

2. Introduction

2.1 Importance of peatlands

Peatlands are lands on peat soils which consist almost entirely of organic matter (at least 80% organic material). [2] Peatlands that still actively form new peat are called mires. Mires are ecosystems characterized by the accumulation of organic matter (peat) derived from dead and decaying plant material [3] providing a positive net carbon balance (net carbon sequestration). Despite the fact that only 3% (4 million km^2) of the land area of the world is peatlands, these ecosystems store 500 Gigatons of carbon i.e., more than 30% of all global soil carbon and twice the total amount of carbon in the biomass of all the world's forests. **Fully functional, healthy peatlands are the most space efficient long-term carbon store and sink in our planet's biosphere.** [4]

[1] https://ec.europa.eu/clima/news/commission-sets-carbon-farming-initiative-motion_en
[2] Rydin, H., Jeglum, J.K. and Bennett, K.D., 2013. *The biology of peatlands, 2e*. Oxford university press.
[3] Wheeler, B. D., & Proctor, M. C. F. (2000). Ecological gradients, subdivisions and terminology of north-west European mires. Journal of Ecology, 88(2), 187–203. https://doi.org/10.1046/j.1365-2745.2000.00455.x
[4] https://www.eurosite.org/wp-content/uploads/CAP-Policy-Brief-Peatlands-in-the-new-European-Union-Version-4.8.pdf

Despite their importance, about 15% of the world's peatlands have been drained [5] for agricultural use, extracted for horticultural use or burned and mined for fuel. Global annual GHG emissions from drained peat soils are roughly 1.6 Gigatons CO_2eq/year, about twice that emitted directly from aviation. [6] Europe has experienced the largest peatland losses, where peat has ceased to accumulate in over 50% of former peatland areas. When drained or burned, peatlands release centuries of stored carbon into the atmosphere, turning from a net carbon sink to a carbon source (Figure 1). CO_2 emissions from drained and burned peatlands equate to 10% of all annual fossil fuel emissions. In the EU, more than 5% of all GHG emissions come from degraded peatlands. In some EU countries (including the UK), drained peatlands contribute to more than 25% of total emissions from agriculture and agricultural land use. [7]

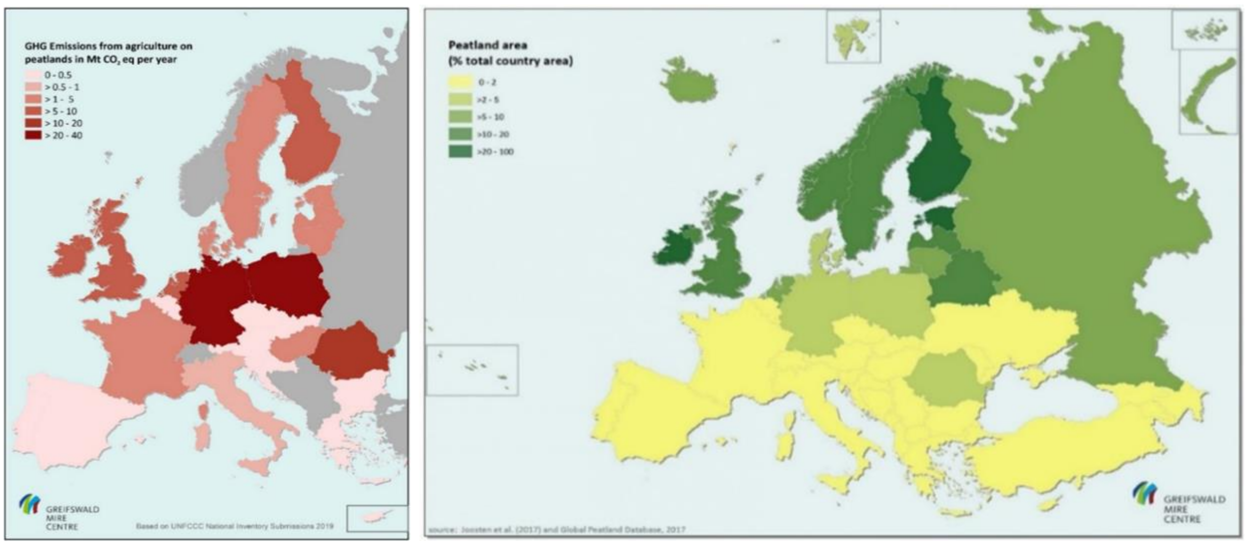

Figure 1 Map from Greifswald Mire Centre showing greenhouse gas emissions from agriculture on peatlands in the EU Member States (left). Map showing Peatland distribution across Europe indicating proportions of peatlands of the total country area (right).

However, it is possible to reverse this process and ultimately turn degraded peatlands from major CO_2 sources to carbon neutral or carbon sink systems through rewetting and restoration.

Therefore, restoration and rewetting of damaged or drained peatlands and subsequent sustainable use and maintenance of functional peatlands are the highest priority for reducing GHG emissions and climate change mitigation. Furthermore, conversion of traditional agricultural practices on drained peatlands to wet agriculture or Paludiculture [8] could further support a reduction in greenhouse gas emissions. While peatland emissions are reported by EU

[5] https://www.ramsar.org/sites/default/files/documents/library/ny_2._korrektur_anp_peatland.pdf
[6] https://www.wetlands.org/news/countries-can-strengthen-climate-plans-2020-peatland-mangrove-targets
[7] https://www.eurosite.org/wp-content/uploads/CAP-Policy-Brief-Peatlands-in-the-new-European-Union-Version-4.8.pdf
[8] https://www.eurosite.org/wp-content/uploads/paludiculture_CAP_definition_final.pdf

countries in their National Inventory submissions to UNFCCC, they are not yet fully accounted for in every case mainly because of deficits in data and funding for research and monitoring.

Besides their role as a natural carbon sink, peatlands provide many additional Ecosystem Services (ESS) such as the regulation and maintenance of water quality and quantity, flow attenuation, groundwater replenishment, evaporative cooling, socio economic benefits and nursery / long term habitats important for biodiversity.

Therefore, by preserving, protecting and restoring peatlands, we can reduce emissions and revive an essential ecosystem with high values and co-benefits for climate regulation, biodiversity, conservation, and human welfare.

2.2 The need for financial incentives for rewetting

In order to restore degraded peatlands, they need to be made wet again, i.e., they need to be **rewetted**. This requires raising groundwater levels and transformation from unsustainable drainage-based agriculture to sustainable wet-farming (e.g. Paludiculture), or ecological restoration of non-productive peatlands. The costs of rewetting are determined by the type and severity of the degradation, costs of restoration planning, on-the-ground actions and associated monitoring, and opportunity costs of foregone market income. The costs of continued harmful use of degraded peatlands also needs to be considered.

Peatland restoration is costly. A review of peatland restoration costs from planning, actions and monitoring in the UK found a median cost equivalent to €2,465 per ha (Holden et al., 2008) with much higher costs in highly degraded habitats including bare, former-extracted peatlands and inaccessible upland areas. In Germany and the Netherlands costs usually range between €1,500 to €3,500 per ha (e.g. Van Belle et al., 2012, SKP 2020). [9] Long-term rewetting costs can be negative when drainage infrastructure requires high investments at short depreciation intervals. Between 1993 and 2015, the EU-LIFE nature programme alone has invested €167.6 million in 80 projects, which aim to restore over 913 km^2 (91,300 hectares) of peatland habitats in Western European countries, mostly in protected sites which are part of the Natura 2000 EU network (Anderson et al. 2017). This equates to €1,836 per ha. The Living Bog EU-LIFE project (NPWS) (2016-2020, ongoing) targeted the restoration of 2,600 ha of raised bog across 12 sites in Ireland with an overall budget of €5.4 million (equivalent to €2,076 per ha). However, costs of restoration by farmers on farmland would be significantly reduced if they do the work themselves with existing equipment.

[9] https://www.bij12.nl/wp-content/uploads/2021/03/Standaardkostprijzen-Natuur-en-Landschap-2020-subsidie-2021.pdf

After restoration, maintenance costs are incurred to maintain restored peatlands in the desired state. These are considerably cheaper, for instance in the Netherlands the costs for maintenance of fens and bogs are estimated at €157 – €519 per ha/yr. [10]

Opportunity costs in the Netherlands can be regarded as an upper estimate of such costs, as market income from and land prices of Dutch peat meadows are substantially higher than elsewhere in Europe (EUROSTAT 2021). [11] The loss of market revenues when raising Dutch ditch water levels from 80 cm below surface level to 10 cm below the surface is estimated to range between €387 to €1,358 per ha/yr (Daatselaar & Prins, 2020; RVO, 2021). [12]

To make rewetting feasible it is therefore essential to establish long-term payment measures as incentives for farmers and landowners. In this paper we identify and discuss the suitability in a peatland context of two payment options:

- Market-based incentives: Carbon Credit systems (section 3).
- Payment for ecosystem services from peatlands (section 4).

3. Market-based incentives: Carbon Credit systems

A Carbon Credit is a unit of measurement that represents either the removal or the prevented emission of one ton of carbon dioxide equivalent (1tCO_2eq) from the atmosphere. [13] It does not include however the ongoing storage of CO_2 in the ground. Buying such Credits enables a buyer to offset [14] their GHG emissions, [15] while enabling a seller to finance the changes needed to reduce GHG emissions. There are two main types of Carbon Credit system: mandatory, i.e., Cap-and-Trade Systems and voluntary, the latter, primarily associated with Corporate Social Responsibility (CSR) but potentially associated with policy or legislative mandates.

3.1. Compliance carbon market vs. Voluntary Emissions Reductions systems

To limit or reduce greenhouse gas emissions, countries with commitments under the Kyoto Protocol must meet their targets primarily through national measures. As an additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms i.e., the

[10] Excluding specific high maintenance types Rich fen and Poor fen; https://www.bij12.nl/wp-content/uploads/2020/08/Subsidietarieven-SNL-beheerjaar-2021-versie-12-8-2020.pdf
[11] https://ec.europa.eu/eurostat/cache/metadata/en/apri_lpr_esms.htm
https://ec.europa.eu/eurostat/documents/749240/749310/Research+Paper+Agricultural+Land+Prices+and+Rents+data+for+the+European+Union%2C+December+2016/15fad00e-6f46-4ee1-9c36-5bfc325b2384
[12] https://www.rvo.nl/sites/default/files/2021/06/Regionormen-en-veranderpercentages-2020-en-2021.pdf
[13] Gold Standard: https://www.goldstandard.org/resources/faqs
[14] Carbon offset: A reduction in emissions of carbon dioxide or other greenhouse gases made in order to compensate for emissions made elsewhere. Offsets are measured in tonnes of carbon dioxide equivalent (tCO2eq).
[15] Greenhouse gases are all gases that contribute to the greenhouse effect of the earth or global warming. Well known GHG gases emitted by human activities are CO_2, CH_4 and N_2O.

Clean Development Mechanism (CDM), Joint Implementation (JI) and Emissions Trading (ET), thereby, creating what is now known as the compliance carbon market, implemented by the EU Emissions Trading System (EU ETS). [16] The rules of the scheme do not allow developed nations to use land use projects as offsets. The compliance market is therefore restricted to developing countries for funding projects to reduce GHG emissions.

The Kyoto Protocol [17] established sets of binding emission reduction targets on the greenhouse gas (GHG) emissions of countries that have ratified the protocol. Countries must meet their targets within a designated period, of time, by:

- Reducing their own emissions.
- Trading emissions allowances with countries that have a surplus of allowances.
- Meeting their targets by purchasing compliance Carbon Credits.

The voluntary carbon market functions outside of, but in parallel with, compliance carbon markets. Credits that originate from the voluntary CO_2 market are called Voluntary Emissions Reduction (VER) Credits. Currently VER Credits are mostly used by companies who are looking to voluntarily offset emissions generated during their business activities. Primarily they wish to demonstrate Corporate Social Responsibility (CSR) or to establish a green corporate image. A growing number of travel agencies and transport companies are now starting to offer the option of offsetting travel-related emissions, to their customers

Therefore, in the voluntary market, the trading of Carbon Credits is not related to an allowance to emit but more to a voluntary action to support and promote a project which reduces global emissions. Voluntary trading schemes ultimately depend on parties (businesses, governments, NGOs, and individuals) that want to reduce their carbon footprint, even though they may not be legally required to do so. Such parties may want to reduce their net carbon emissions by paying others to take carbon out of the atmosphere or prevent it from being emitted. The amount of carbon emissions saved is again measured as Carbon Credits. In some countries, governments require certain businesses to report their carbon, this is outside the scope of the compliance market and these businesses are keen to buy voluntary Carbon Credits as part of their reporting.

Unlike the compliance carbon market mechanisms, **there are no established rules and regulations for the voluntary carbon market**. Instead of undergoing national approval from the project participants and the registration and verification process from the UNFCCC, the calculation and certification of emission reductions is often implemented in accordance with industry-created or project-specific standards or rules.

[16] https://ec.europa.eu/clima/policies/ets_en
[17] https://unfccc.int/kyoto_protocol

While a voluntary emission reduction Credit (VER) cannot be used by entities to meet their obligations under the compliance scheme of the Kyoto Protocol, a Compliance Carbon Credit i.e., certified emission reduction, (CER) can be purchased by entities wanting to voluntarily compensate for their emissions.

Compared to the compliance market, trading volumes in the voluntary market are much smaller because demand is created only by voluntary offset buyers, whereas in the compliance market demand is created by a regulatory instrument. On the other hand, the voluntary market also includes other aspects such as social and ecological benefits, like ecosystem services, that a certain project or activity can enhance. This is not the case for the compliance market, which considers only GHG emissions.

According to Forest trends, in 2016, 63.4 $MtCO_2eq$ [18] were globally transacted in the voluntary carbon markets. This is on the lower end of the spectrum of volumes tracked over the years, which has ranged from 12 to 135 $MtCO_2eq$ between 2005 and 2016. Figure 2 gives an overview of the voluntary offset transaction volume.

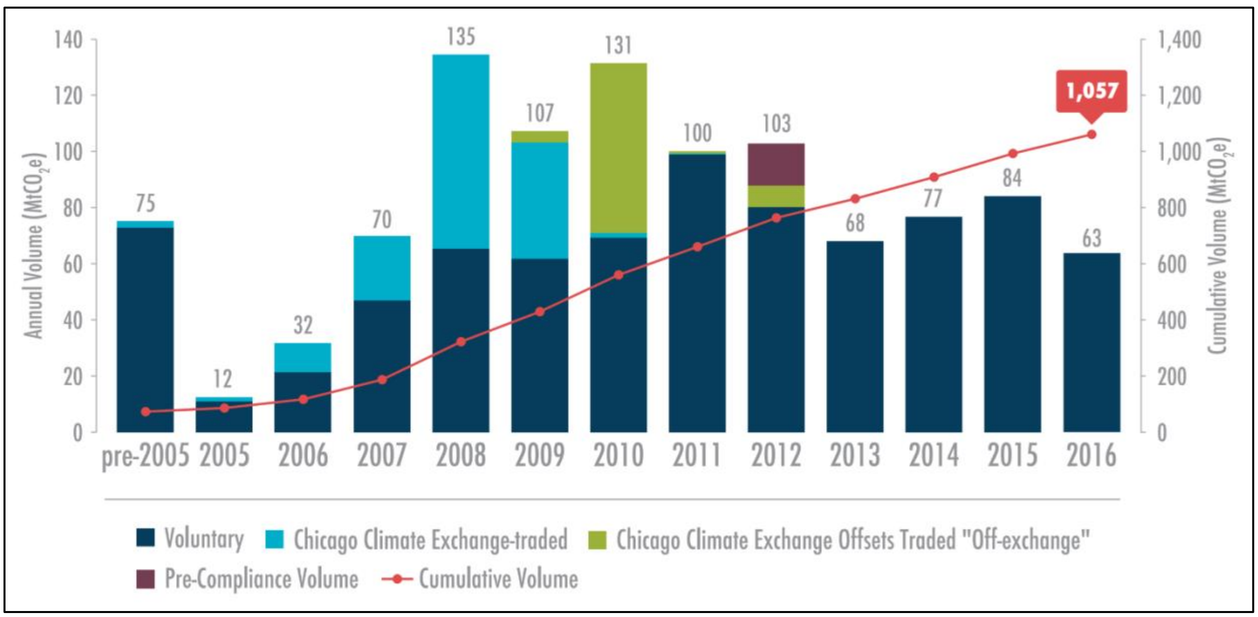

Figure 2 Historical Market-wide Voluntary Offset Transaction Volumes. From "Unlocking Potential State of the Voluntary Carbon Markets 2017 Forest Trends' Ecosystem Marketplace" https://www.cbd.int/financial/2017docs/carbonmarket2017.pdf

Notes: Based on survey responses representing 1,057 $MtCO_2eq$ transacted pre-2005 to 2016. The Chicago Climate Exchange (CCX) volume represents transactions from US-Based projects by US buyers anticipating regulation. It is considered 'pre-compliance' because at the time, buyers were acting voluntarily in anticipation of cap-and-trade in the United States. After the legislation failed to pass in 2009, CCX tonnes continued to be traded on a voluntary basis, 'off-exchange'. Additional pre-compliance volumes were documented in the lead up to California cap-and-trade and Australia's (now repealed) carbon tax.

[18] https://www.forest-trends.org

An increasing number of companies are investing in VER projects to reduce their carbon footprint to reach a "net zero emission" status and create an environmentally friendly corporate identity. Table 1 (below) shows the sales of voluntary Carbon Credits for peatlands as part of the MoorFutures® scheme. This scheme operates over 50-years with reviews every 10 years. According to Dr. Till Backhaus, Minister for Agriculture, Environment and Consumer Protection, Mecklenburg-Western Pomerania (Germany), Carbon Credits were sold on the voluntary carbon market through the MoorFutures® scheme – together with the federal states of Brandenburg (since 2012) and Schleswig-Holstein (since 2014). Prices per ton of CO_2eq from rewetted peatlands sold at the time of writing range from €29.41 to €67.23 (ex VAT). MoorFutures® prices relate directly to individual project costs, including land purchase where necessary, divided by the expected GHG emission reduction. The first sale of Carbon Credits from rewetted peatlands in the Netherlands achieved €70 per ton of CO_2eq in 2020. All of these schemes were 100% successful. With potential incomes per hectare per annum at the high end approaching €1,000, this compares favourably with many other potential land uses (see: Economic land use analysis relating to peatlands). It is important to note that this income does not necessarily preclude the land being used for other income deriving purposes such as provision of commercial services, wet farming on peatlands (Paludiculture) including biomass and agricultural or environmental subsidies. However, a fully blended and optimal financial model depends on the principle of additionality being met (see: Additionality).

Table 1: Price per ton of CO_2eq sold as part of the MoorFutures® Scheme https://www.moorfutures.de

Scheme	Area Hectares	Tons per ha per yr	Volume tCO_2eq	Duration Years	Price per tCO_2eq inc (ex VAT)	Gross Annual Income per ha per yr (ex VAT)
Gelliner Bruch – Mecklenburg – Western Pomerania	6.7	17.3	5,800	50	€33.62	€581.63
Polder Kieve – Mecklenburg – Western Pomerania	54.5	5.3	14,325	50	€29.41	€155.87
Cameroon meadow – Mecklenburg – Western Pomerania	8.0	7.5	3,000	50		
Rehwiese – Brandenburg	9.7	13.9	6,744	50	€67.23	€934.50
Königsmoor – Schleswig – Holstein	68.0	11.6	39,520	50	€53.78	€623.85
Average figures for all schemes	29.4	11.1	13,878	50	€46.01	€510.71

3.2 Advantages of the Voluntary Market

The advantage of lower development / transaction costs, make the voluntary market especially attractive to those small and sustainable projects for which the UN certification process is too expensive or complex. Voluntary markets can also serve as a testing field for new procedures, methodologies and technologies that may later be included in regulatory schemes. This can allow for experimentation and innovation because projects can be implemented with fewer transaction costs than compliance market projects under Kyoto protocol mechanisms. Voluntary markets also serve as a niche for micro projects that are too small to warrant the administrative burden of EU ETS [19] for projects currently not covered under compliance schemes.

3.3 Voluntary Carbon Market: Measuring, Reporting and Verifying Carbon Credits

The practice-oriented proxy methodologies currently under development in Europe and SE Asia (based on water level, vegetation, and subsidence) including the Bali Action Plan are very promising with respect to calls for climate mitigation actions that are measurable, reportable, and verifiable (MRV). [20] It is concluded that – whereas further development is necessary and is being pursued in current research and implementation projects – these methodologies will enable cost-effective and reliable baseline setting and monitoring of GHG emissions. This will allow the inclusion of peatland conservation and rewetting in a post-2021 climate framework.

This analysis implies that it is possible to quantify the results of individual actions and – thanks to the methods of assessment – to report them in a consistent and transparent way. Appropriate verification by third party review is important to build confidence among parties and to ensure that adequate information is available to assess progress against the objectives of UNFCCC. [21]

The voluntary carbon market is based on very specific criteria for measuring, reporting and verifying Carbon Credits which are:

Additionality: This means that a project would not have gone ahead in a 'business as usual' scenario and that any emissions reduction is 'additional'. Spontaneous developments or developments that happen anyway − e.g. because they are required by law or are attractive from an economic standpoint − are not 'additional' even if they result in a substantial reduction in GHG emissions. Various methods for assessing additionality are used within voluntary and mandatory carbon standards. Assessment of additionality also varies from country to country. Below we examine the additionality requirements outlined in the German MoorFutures® scheme, the UK Peatland Code and the Dutch Green Deal National Carbon Market.

Measurability: This ensures that emissions reduction achieved by a project can be quantified in a transparent and verifiable way. For example, an adapted greenhouse gas emission site types (GEST) approach was used to measure project sites in Germany. Improved site type data and classification in all countries will improve measurability. This approach uses recognized or registered verification / validation bodies to examine the site using a list of proxies which are based on collected scientific evidence of similar sites.

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[19] https://ec.europa.eu/clima/sites/clima/files/ets/revision/docs/review_of_eu_ets_en.pdf
[20] http://www.imcg.net/media/download_gallery/climate/joosten_couwenberg_2009.pdf
[21] Joosten et al. 2015 - https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript407.pdf

Verifiability: This requires that an independent third party must be able to verify the quantification of emissions reduction, on the basis, of previously defined criteria. Verification provides assurance to buyers of Carbon Credits.

Conservativeness: This means that emissions should be underestimated in the baseline and overestimated in the project scenario. This helps to ensure that a project can provide near certainty that it will achieve its GHG emissions reduction targets. (See more in the Peatland Code section).

Reliability: Complete and reliable documentation is necessary not only to avoid double selling but also to create confidence in the market. For this reason, the trading of Carbon Credits must be documented indisputably in central registries. The use of smart systems platforms may help to overcome this issue.

Transparency: Online registries provide an open and transparent record of all aspects of approved projects.

Sustainability: Projects should not contribute to the deterioration of socioeconomic or environmental conditions but instead conserve or improve them.

Permanence: When emissions reduction projects come to an end there is a risk that any carbon saved or captured will be emitted due to a possible lack of future funding. To avoid or reduce this risk, reversals must be prevented with long-term contracts or legal measures, and effectively made permanent.

Baseline: GHG emissions reduction from a project activity are quantified relative to baseline emissions for the project duration. Baseline GHG emissions are derived from the baseline scenario of the project area. The baseline scenario is a continuation of the current peatland condition category and hence a continuation of current GHG emissions ('business as usual'). The UK Peatland code uses a Peatland Code Emissions Calculator (Ref: Peatland Code V1.1 2017), whereas MoorFutures® uses a baseline scenario from reference sites with similar groundwater level and vegetation cover using the GEST methodology.

Duration: This refers to the timespan of a peatland rewetting and / or restoration project. Commonly this is 50 years, with a minimum of 30 years for the schemes examined, however there is a question mark about any sale of reduction Carbon Credits beyond 2050 when net zero carbon is due to be achieved.

Leakage: This term describes the case that higher emissions are caused outside the project boundary by implementing a reductions project. Generally, projects must be designed to prevent this from happening.

Co-benefits: This refers to gains other than emissions reduction derived from rewetting and / or restoring peatland functionality. These can include improved water quality, flow attenuation, groundwater enrichment, evaporative cooling and increased mire typical biodiversity.

3.4 Existing voluntary offset certification systems

The reliability of Carbon Credits is partly based on the validation process [22] and sophistication of the fund or development company that acts as the sponsor to the carbon project. In voluntary systems the value of Carbon Credits can be set by an agreement of the project partners, for instance based on measures implemented and investments needed, and not accounting for market price fluctuations. Below we outline the most widely recognized certification systems.

3.4.1. The Verified Carbon Standard

The Verified Carbon Standard (VCS) [23] is the most widely used standard for land use projects. It focuses on GHG reduction attributes only and does not require projects to have additional environmental or social benefits. The VCS is broadly supported by the carbon offset industry (project developers, large offset buyers, verifiers and projects consultants).

From 2008, VCS includes guidelines for the development of projects in agriculture, forestry and other land use (AFOLU) sectors. The four VCS modules that relate to peatlands are as follows:

VM0036 Methodology [24]

This methodology outlines procedures to estimate the reduction of net greenhouse gas emissions resulting from project activities implemented to rewet drained peatlands in temperate climatic regions. It allows for the estimation of GHG emissions from drained and rewetted peatlands and also accounts for changes in carbon stocks in selected non-peat carbon pools. The scope of this methodology is essentially limited to project activities that aim at the rewetting of peatlands that have been drained for forestry, peat extraction or agriculture, but where these activities are not or no longer profitable. Post-rewetting land use is limited to forestry, agriculture, nature conservation/recreation, or activities limited to those aiming at GHG emission reductions, or a combination of these activities. This methodology uses ground vegetation composition and water table depth as proxies for peatland GHG emissions, known as the 'GEST' approach (GEST: greenhouse gas emission site type).

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[22] Are peatland emission reductions MRV-able? https://www.wetlands.org/publications/are-emission-reductions-from-peatlands-mrv-ableae/
[23] www.verra.org
[24] https://verra.org/methodology/vm0036-methodology-for-rewetting-drained-temperate-peatlands-v1-0/

BL-PEAT

This module applies to the baseline scenario of wetlands restoration and conservation (WRC) project activities on peatlands that are expected to be or remain (partly) drained in the absence of the project activity. It is applicable to Rewetting of Drained Peatlands (RDP) and Conservation of Undrained or Partially Undrained Peatland (CUPP) activities on project areas that meet the VCS definition for peatlands. The scope of this module is limited to domed peatlands in the tropical climate zone.

M-PEAT

This module provides approaches for monitoring GHG emissions from undisturbed, degraded and rewetted domed peatlands. The module addresses GHG emissions from the soil organic (peat) carbon pool due to drainage, rewetting and fire. It is applicable to RDP and CUPP activities as defined in VCS *AFOLU Requirements*. The project area must meet the VCS definition for peatlands. This module is limited to domed peatlands in the tropical climate zone.

E-BPB

This module provides a step-wise approach for estimating GHG emissions from biomass burning and peat burning. It is applicable to avoiding unplanned deforestation or degradation, avoiding planned deforestation and avoiding degradation project activities, whether or not situated on peatlands.

3.4.2 The Gold Standard

The Gold Standard was developed in 2003 by a group of NGOs. It is the first independent and the most rigorous certification system for creating high-quality carbon offset projects both in compliance and voluntary carbon markets. So far, the Gold Standard is supported by more than 80 civil society groups and many corporations but also by the UN and many national governments. The Gold Standard ensures that the generated Carbon Credits are real, verifiable, and measurable contributions to GHG emission reduction.

The Gold Standard is regarded as an independent set of criteria to evaluate carbon projects internationally. The objective is to label carbon projects which are both ecologically and socially effective.

Emission-reduction projects under compliance carbon market schemes labelled by the Gold Standard (GS CDM Projects) must be verified by UN-authorized independent auditors and must meet even stricter requirements than normal projects. This unique quality standard is chosen to demonstrate a broader corporate-social-responsibility commitment and it is more likely that Credits from Gold Standard projects will remain eligible in future compliance regimes.

International banks, insurance companies, public authorities or individuals often use these high-standard Carbon Credits.

3.4.3 Low Carbon Label (France) [25]

In France, the Low Carbon Label provides a financial incentive to projects or activities that reduce direct GHG emissions, as well as indirect emissions and carbon storage. The purpose of the low-carbon label is to certify voluntary reduction projects that go above and beyond standard practice. The certification is granted by an independent third party. To promote the financing of the certified projects, the low-carbon label certified emissions standard specifically provides for the participation of financial partners who will be able to claim that they contributed to the additional GHG reductions resulting from such projects. To be recognized, a Carbon Credit allowed by agricultural and forestry projects has to conform to environmental integrity criteria defined in the standard. Standard and methodologies are both approved by the ministère de la transition écologique et solidaire in French (MTES). Several methodologies exist for forestry, cattle, lands. Recently the national féderation of « conservatoire des espaces naturels » (conservatory of natural landscape) announced 3 new methodologies [26] including one for peatland restoration.

3.5 Examples of existing European Carbon Credit systems in peatlands

Regional markets such as MoorFutures® and National markets such as the Peatland Code were established because of the high costs associated with VCS and the Gold standard. These more global standards are likely to work better in developing countries with lower labour costs.

3.5.1 Germany - MoorFutures® [27]

The MoorFutures® scheme was introduced in Mecklenburg-Western Pomerania in 2010 as the first regional Carbon Credit scheme for peatland rewetting in the world. [16] This scheme has set the standard in Europe and a considerable portion of this document is informed by MoorFutures®.

Certificates were issued for measures that result in reduced GHG emissions or in increased carbon sequestration through agriculture or forestry, but not for carbon storage. The Credits have been sold in the German federal states of Brandenburg, Mecklenburg-Western Pomerania and Schleswig-Holstein to offset unavoidable emissions produced by corporations, organisations and individuals; revenues have been used to finance rewetting. MoorFutures® follows its own

[25] https://www.ecologie.gouv.fr/label-bas-carbone
[26] https://reseau-cen.org/fr/actualites-agenda/le-stockage-carbone-dans-les-espaces-naturels
[27] www.moorfutures.de

standard that strongly builds on VCS, and uses the GEST [28] approach for quantification of GHG emission reduction.

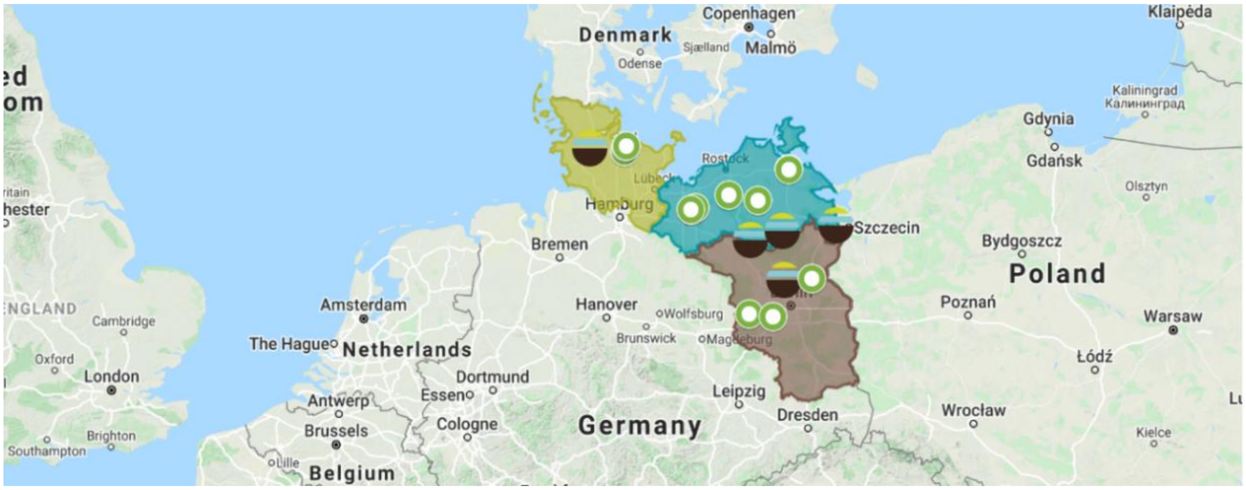

Figure 3. Location of the Moorfutures® scheme in Germany.

MoorFutures®: Carbon offsets from rewetting

- Suitable land is bought by the 'Landgesellschaft' [29] a public-private venture of the regional government and rewetting (not restoration) is planned.
- Emission reductions estimated with GEST.
- MoorFutures® Credits issued and registered by the State's Ministry for Environment and Agriculture.
- 1 MoorFutures® Credit = 1t CO2eq.
- Water table registered in official land use plans.
- Rewetting works carried out and legally protected (sustained).

Reasons for regional MoorFutures® Standard

- Regional clients interested in regional offset opportunities – a niche market.
- Sale on international markets requires certification by international standards (VCS) - too expensive for small peatland areas.
- MoorFutures® follows VCS criteria but is adapted to fit the regional situation.
- MoorFutures® builds on credibility of the States' regulatory system and the high capacity of universities and administration to develop, manage and monitor.

[28] https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript407.pdf
[29] https://www.lgmv.de

3.5.2 United Kingdom – The Peatland Code [30]

The Peatland Code is a voluntary national standard for UK peatland projects wishing to market the climate benefit of peatland restoration. It was launched initially in 2015 by the UK government. It is intended that the code will follow the path set out by the Woodland Carbon Code (est. 2011) by achieving full ISO14065 audit status, and having its Credits listed on the Market Registry. It is administered by the IUCN UK Peatland Programme. The IUCN UK Peatland Programme is the mechanism through which buyers are assured that the climate benefits being sold are real, quantifiable, additional and permanent.

The Peatland Code sets out a series of best practice requirements including a standard method for quantification of GHG benefits. Independent validation to this standard provides assurance and clarity for buyers with regards to the quantity and quality of emissions reductions purchased. Recognising that carbon benefits exist for many years after the initial restoration activities are implemented, the Peatland Code also ensures the carbon benefit will be regularly measured and monitored over the lifetime of the project (minimum 30 years). Buyers can therefore be confident in purchasing peatland carbon units. Funding obtained from the sale of GHG benefits can sit alongside traditional public sources of funding, providing cost effective peatland restoration and ensuring management and maintenance of restoration projects over the long term.

The Peatland Code gives:

- Carbon buyers, the guarantee that they have facilitated a responsible scheme, which will result in additional climate benefits.
- Projects, recognised procedures and standards to work with. Projects can use their validated / verified status as a means to market the carbon benefits to potential buyers.
- Society, the benefits from enhanced climate mitigation and the restoration of the natural landscape.

The end of January 2021 saw the long awaited, formal inclusion of peatlands in the UK GHG emissions inventory. [31] The Department of Business, Energy and Industrial Strategy (BEIS) released 'Planned methodology changes for UK greenhouse gas emissions statistics 1990-2019'. The report summarises that inclusion of new peatland data increases their contribution to national emissions to 3.5% (as opposed to 2.3% reported in the 1990 baseline). For individuals or

[30] IUCN UK Peatland Programme (2020) *The IUCN UK Peatland Programme*, IUCN UK Peatland Programme, c/o Harbourside House, 110 Commercial Street, Edinburgh, EH6 6NF. Accessed 19/04/2020 https://www.iucn-uk-peatlandprogramme.org
[31] https://www.iucn-uk-peatlandprogramme.org/news/peatland-addition-uk-ghg-inventory-adds-35-national-emissions

organisations wanting to support peatland restoration projects as part of their corporate social responsibility activities, Peatland Carbon Units can be reported in annual GHG, environmental or other reports as well as signage, websites or other promotional materials. At the time of writing, the IUCN UK Peatland Programme has validated 4 restoration projects with a further twenty projects under development, covering 4,232 hectares in total. As a result of scientific uncertainties surrounding peatlands and their carbon emissions the Peatland Code has highly conservative eligibility criteria which restricts its applicability to many peatland types in the UK. The Peatland Code is currently restricted to restoring certain types of peatland (e.g. eroded and drained peatland):

- The Code only applies to blanket bog or raised bogs with >50 cm depth of peat – fens are not covered by the Code, but a future update will include this habitat.
- Only "Drained" (defined as peat within 30 m of an active artificial drain or erosion gully / hag) or "Actively Eroding" peatlands (defined as extensive bare peat within hag / gully systems or extensive continuous bare peat, e.g. peat pan or former cutting site) are included.
- Modified peatlands outside of these categories, even if degraded, and near-natural peatlands are not eligible for the Code.
- Removal of forestry from peatlands or reversion of arable or grassland habitats to fen or bog communities is also ineligible.
- Requires a minimum term of 30 years and a maximum of 50 years.
- Projects must meet strict additionality criteria including a requirement of at least 15% of the project costs coming from carbon financing.

3.5.3 Netherlands - Valuta voor Veen (VvV) & the Green Deal National Carbon Market [32]

In June 2020, the first verified CO_2eq certificates were issued on the voluntary market in the Netherlands. The CO_2eq certificates came from 32 hectares of agricultural peat pastures and were based on the Valuta voor Veen (Currency for Peat) accounting method. [33] It has been carried out by the Noardlike Fryske Wâlden, Leeg Midden, Project LTO Noord and the Frisian Environmental Federation (FMF). The accounting method is still under development. The first versions use a mix of ditch water levels and proxies for the mean annual groundwater level to calculate GHG-emissions and emission reductions from raising (ditch) water levels while maintaining productive (intensive) land-use. Current method refines investigates to what extent

[32] https://nationaleco2markt.nl
[33] https://nationaleco2markt.nl/wp-content/uploads/2018/10/GDNK-Groen-Veenweide-001.pdf

carbon reduction may be overestimated without a substantial increase of carbon sequestering plants and vegetation (Tiemeyer et al. 2016, [34] Evans et al. 2021. [35])

VvV aims to compensate for the loss of farmers' income due to rewetting and operates on a purely voluntary basis. VvV focuses on potential emissions reduction without substantial changes in current land-use intensity and business models.

VvV estimates that to compensate a farmer's cost for raising the water level to 30/35 cm below the surface, the Carbon Credit should be sold for at least €18 per ton of CO_2eq. Famers with high livestock densities would require higher compensation costs (exceeding €80 per ton of CO_2eq).

According to the VvV criteria farmers can reduce their CO_2eq emissions of drained peat soils in three different ways:

- Maintain agricultural peat meadows at a higher groundwater level, including extensive grassland farming (nature-inclusive agriculture). Active and passive subsoil drainage to rewet peat meadows is still under investigation.
- Paludiculture, a strategy for working with wet crops at a much higher water level.
- Nature development at a much higher groundwater level. This also means a change in land use from agriculture to nature.

Certification is carried out by an independent party i.e., the National Carbon Market Foundation [32] and will result in additional costs for the farmer for the issuing of certificates. [32] After being validated by a single consultant (private company) [36] certificates can be purchased from the National Carbon Market. [37] Their most important tool is the public register containing details of all projects with carbon certificates outlining the status (submitted for validation, validated, operational, verification report issued, certificates issued, certificate holder) and details of the lead party of the project.

3.6 LIFE projects - Carbon Credit methodology to measure climate impact

LIFE projects and similar nature / climate orientated projects are regularly required to estimate climate benefits. Usually these types of projects need to focus their resources on restoration and on-site measures leaving insufficient opportunities for GHG monitoring. At the same time vegetation mapping data and basic hydrological monitoring data are available. The methodologies deployed in MoorFutures® and the Peatland Code are sensitive to peat-forming

[34] Tiemeyer et al. https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.13303
[35] Evans et al. https://doi.org/10.1038/s41586-021-03523-1
[36] https://nationaleco2markt.nl/register/ (company is named A. Energie Advies in the latest document from 2021-10-11)
[37] https://platformco2neutraal.nl

vegetation and environmental conditions controlling GHG emissions. The methods of both schemes offer thereby a suitable framework for estimating climate benefits. For the Netherlands the GEST [38] approach was used in 4 different projects. For the LIFE+ project 'Peelvenen' and 'Grote Peel' the effectiveness of measures was estimated to accumulate from 5,000-10,000 tons of CO_2eq per year for a 2,000 ha project area. In the Drentse Aa area successive peatland rewetting since the 1980s was estimated to exceed 6,000 tons of CO_2eq per year with the largest emission reduction in some 600 ha peatland restoration sites. At the Fochteloërveen reserve the increase in climate damage was estimated to amount to 4,500 tons of CO_2eq per year of additional emissions without measures stabilizing the local hydrology. For the same site an emission reduction of 700-3,500 tons of CO_2eq per year was estimated if peat-forming *Sphagnum* vegetation was included.

The magnitude of the emission reduction is reported to subsidy authorities and governmental institutions. Based on the emission reduction estimates, restoration measures can be prioritized and sufficiently financed. By including Carbon Credit methodology early in project planning, it potentially increases the climate benefits. This again may result in better access to public-private financing of climate measures in peatlands.

3.7 General Considerations for Carbon Credit accounting schemes

In this section we examine reference criteria, CO_2 uptake and CO_2 stock.

3.7.1 Reference criteria

Table 2 (below) compares the reference criteria for Carbon Credits in pioneer schemes and frameworks for the international standards commonly associated with peatlands.

3.7.2 CO_2 uptake and CO_2 stock

Peat soils store a lot of carbon (C), or in other words: the C stock in peat is large. Fully or partially drained peatlands emit carbon that ultimately derives from the C stock of the peat. When rewetted the carbon emissions from such degraded peatlands will be greatly reduced, [39] although they will not necessarily stop emitting carbon immediately upon rewetting. With the right water management, rewetted peatlands can even become carbon sinks again, adding Carbon to the Carbon stock in the soil and sequestering CO_2. However, rewetting also leads to a shift from CO_2 emission to CH_4 (methane) emission. This is important because methane has a much stronger climate forcing effect than CO_2, although the lifetime of methane is shorter. Therefore, extra

[38] https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript407.pdf
[39] Günther et al. 2020 https://www.nature.com/articles/s41467-020-15499-z.pdf?proof=tNature

measures should be taken to prevent prolonged and excessive methane leakage from rewetted peatlands through careful management of the water table. [40]

Table 2: Interpretation of reference criteria for Carbon Credits in pioneer schemes applied to peatlands and frameworks along with the international Carbon Credit scheme standards.

Criteria	MoorFutures® DE	Valuta voor Veen NL	Peatland Code UK	VCS	Gold Standard	Low Carbon Label
Additionality	Required	Required	Required	Required	Required	Required
Measurability	GEST carried out by University of Greifswald	Water level as the proxy	Field survey following code protocol	Rough estimate allowed (IPCC tier default)	UNFCCC CDM methodology or a GS-Approved VER methodology	Methodology approved by the MTES
Verifiability	Regional Level	Verification by the National Carbon Market	Validation and verification of site by Certification Body at a National Level	Rough tier	Accredited validation and verification body (VVB)	National Level
Conservativeness	Partially conservative	Partially conservative	Conservative	Conservative	Conservative	Conservative
Reliability	Registered with the Bank of New York Mellon	15% of Carbon Credit certificates are withheld as a buffer	Risk Buffer managed by IUCN UK Peatland Programme	Standards set out at start of project	Standards set out at start of project	Abatement to prevent uncertainties
Sustainability	Deterioration prohibited	Not required	Environmental and Social impact plans required	Deterioration prohibited	Required	Eligibility criteria
Permanence	Limited to100 years	Not defined	Emissions reduction to point of reversal	Limited to 100 years	Not defined	Not defined, abatement guarantee
Baseline	Relies on expert opinions and publications	Determined by water-table	Use the Peatland Code Emissions Calculator	Based on proxies	Based on measurement s or proxies	Evolution scenario and initial diagnosis
Duration	30-100 years	10-50 years	30-100 years	20-100 years	No specific peatland duration	5 to 30 years
Leakage	Minimises through site selection	Prevented by groundwater level control	Requirement to notify leakage at project level	Internationally ignored	Considered	Not considered
Co-benefits	Water quality, flood prevention, groundwater enrichment, evaporative cooling and increased mire typical biodiversity	Water related services	Four types of ecosystem service, provisioning; regulating; cultural and supporting	No co-benefits considered	No co-benefits considered	Co-benefits described in the method
Transparency	Ministry registration with Regional Government	Registry at www.nationaleco2markt.nl	Registry at www.iucn-uk-peatlandprogramme.org/peatland-code-registry	VCS registration	Gold Standard Impact Registry	Ministry registration with National Government

From a crediting perspective, there is a fundamental difference between reducing GHG emissions and sequestering carbon. In the case of GHG reduction, emissions are reduced, but not stopped. Therefore, a certain amount of GHG emissions are still released and peatland oxidised. After a

[40] Koebsch et al. 2020 https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0685

certain period, of time all the carbon (C) stored in peat soil will have been emitted to the air as CO_2 or CH_4. At this moment the peat soil will be lost, and no further emissions of GHG from peat will occur. GHG emission *reduction* is therefore only creditable during the time-period that the emissions are reduced, i.e., the time it takes for all peat to be lost when no rewetting takes place.

Differently, in a peat formation scenario CO_2 *sequestration* can potentially be creditable for an indefinite time. Although GHG emission reduction and CO_2 sequestration conceptually differ, both cases should be included in the Carbon Credit scheme. The aspect to be considered now is which CO_2 should be credited and until when. One option is to take account of the likely timeframe for all remaining carbon stock to be emitted from drained and degraded peatland in a do-nothing scenario.

At the same time, the potential emission reduction of other GHGs like nitrous oxide (from fertilizers and peat mineralization) and methane (from drainage ditches and ponding rainwater) may be largely independent from soil CO_2 stock. This requires a considerable degree of thought and research in order to optimise GHG reduction overall and within the required timeframe.

In order to set up a standardized simple system it is necessary to set a target year for calculating GHG reduction and CO_2 uptake, for example 2050, being the target set by the EU.

3.7.3 Additionality

In the context of the global Carbon Crediting system, the main goal is to reduce CO_2eq emissions and therefore additionality (i.e., the concentration reduced by buying the Carbon Credit) is central. This means that any action towards a reduction of emission cannot be a result of spontaneous developments or developments that would happen anyway − e.g. because they are required by law or are attractive from an economic standpoint.

However, this can lead to what we define as the “**paradox of additionality**” in which there is no economic incentive for farmers and landowners to maintain good environmental practices. In fact, badly designed environmental and subsidy driven schemes may even make it beneficial to implement bad practices before shifting to more sustainable ones. Unfortunately, in some cases, those who are already implementing good practices may not be eligible for a Credit scheme. Therefore, well designed schemes to account for carbon stock and to provide other ecosystem services may give landowners who maintain an existing sustainable management programme an opportunity to receive appropriate incentives for their work.

4. Payment for ecosystem services from peatlands

Functional peatland systems and sustainable (wet) agriculture practices on wet or rewetted peatlands provide additional services to CO_2 emissions reduction, i.e., water storage, water retention and water depuration. Some initiatives have been put in place in the attempt to promote and preserve sustainable peatland management through Payment of Ecosystem Services (PES) and Results Based Agri-Environmental Payment Schemes (RBAPS).

4.1 Payment for Ecosystem Services (PES)

Examples of PES are DEFRA's payment in the UK, [41] the Everglades case in Florida, [42] the Green Water Credits Mechanism developed for Kenya, [43] and ''Catalogus groenblauwe diensten [44] (Catalog of *greenblue* services) in the Dutch system of agro-environmental schemes.

In the case of the UK, DEFRA (UK Department for Environment Food and Rural Affairs) commissioned a set of pilot PES projects. These covered a variety of locations and environmental goals, including peatland restoration. Whilst not strictly a PES scheme, the latter contributed to the development and launching (in 2015) of the Peatland Code under the IUCN Peatland Programme.

The PES programme in Florida focuses on monetizing water and nutrient retention in agricultural fields, making farmers less dependent on "traditional" agricultural subsidies which do not consider environmental impact and do not reward good practices.

The Green Water Credits Mechanism in Kenya (est. 2007) aims to let farmers and hydropower producers downstream pay farmers upstream for groundwater, fresh water and soil conservation actions. In the Upper Tana Basin pilot area (which encompasses 17,420 km^2 and 100,000-150,000 smallholders), preliminary estimates of the annual benefits derived from these 'green water management' practices are put at between US$ 12 and 95 million, compared to annual costs of US$ 2 to 20 million.

In The Netherlands, *Catalogus groenblauwe* is approved by the European Commission and provides a legal framework aiming to improve habitat conditions and water storage in ditches. The *Catalogus* provides a list of activities that can be implemented by landowners that are relevant in the provision of green or blue services. For every activity listed, an associated

[41] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/578005/pes-pilot-review-key-findings-2016.pdf
[42] Bohlen, P.J., S. Luch, L. Shabman, M. Clark, S. Shukla & H. Swain 2009. Paying for environmental services from agricultural lands: an example from the northern Everglades. Front. Ecol. Environ. 7(1):46-55
[43] https://www.futurewater.eu/projects/greenwatercredits
[44] https://www.bij12.nl/wp-content/uploads/2018/11/Hoofddocument-Catalogus-Groenblauwe-diensten-versie-EU-26-oktober-2018.pdf

maximum reimbursement can be calculated. The catalogue serves as a toolkit for local authorities i.e., provinces, municipalities and water boards, to frame and implement their own subsidy system. Payment for *groenblauwe* services is based on the cost of construction and maintenance plus the loss of agricultural productivity. Blue and green services are then put in place for landowners (mainly addressing farmers) that make an extra effort to provide ecosystem services, such as soil improvements for improved water filtration, providing water retention, and taking extra measures aimed at restoring water quality and restoring biodiversity. Also exemplary is the spending of the €150 million that is added to the Dutch RDP due to adaptations resulting from the 'health check' of the CAP (the EU contributes €110 million, national government and provinces €40 million) (Ministerie van LNV, 2009). The budget is almost completely reserved for contributions to biodiversity, water management, landscape, renewable energy etc. through GBS (e.g. ecological management of field edges, agricultural landscape management in National Landscapes, ecological water management, water retention, etc.).

4.2 Results Based Agri-Environmental Payment Schemes (RBAPS) [45]

Within the current Rural Development Regulation (1305/2013), Article 28 (Agri-Environment and Climate (AEC)) is the main mechanism through which AEC measures are implemented in member states' Rural Development Programmes (RDPs). Article 30 (Natura and Water Framework Directive payments) can also be used for payments targeted at designated areas, to compensate for costs resulting from specific restrictions. RBAPS policy frameworks funded through the European Innovation Partnership (EIP) have been developed in a number of EU countries in relation to ecosystem service payments for improvements to water quality on rewetted peatlands.

RBAPS enable regulatory and institutional innovation at member state level with a clear focus on incentivising results rather than imposing penalties. They require an integrated approach to ensure that improvements in the quality of the results delivered are adequately rewarded. Clear objectives and targeting are a prerequisite for well-designed RBAPS measures. Co-operation, knowledge-sharing, capacity and trust building are essential for successful implementation. Long-term commitments to sustain a market-based approach for the provision of water is needed. This will give clear signals to farmers that it is worthwhile to adapt their farm business to enhance biodiversity and associated ecosystem services as an additional output to agricultural production. RBAPS measures can be designed to fit within the existing CAP structure and do not add to the administrative burden on the farm business. One good example is the Freshwater Pearl Mussel Project in the Republic of Ireland. There are similar schemes in other countries.

[45] https://rbapseu.files.wordpress.com/2019/01/rbaps_pd02_public.pdf

4.3 Freshwater Pearl Mussel Project

The Freshwater Pearl Mussel Project[46] (PMP) is a "European Innovation Partnership" funded through the Department of Food, Agriculture and Marine as part of Ireland's rural development programme from 2014-2020. The PMP is an agri-environmental project operating at a pilot-scale aimed at improving water quality of watercourses for protecting and preserving habitat for the endangered pearl mussel species. The PMP focuses on eight freshwater pearl mussel catchments and provides financial incentives to farmers for implementing land use practices which improve water quality.

The financial incentives provided by the PMP to landowners and farmers are determined based on two parameters: a results-based scheme, comprising a habitat quality assessment, a floodplain assessment, and an EU CAP Single Payment Scheme (SPS). The SPS assessments consist of determining farm activities and their resulting impacts on adjoining water bodies i.e.. rivers, streams and lakes located adjacent to the farmlands. The condition of the adjoining water courses is assessed based on presence of livestock, any nutrient applications and sediment transport into water bodies. Essentially, the farm nutrient balance and farmyard management are important components of the whole farm assessment. The farm nutrient balance is applicable to those farms, where cattle are housed in winter. This considers the number of animals housed, their generated slurries and any nutrient application rates. The farmyard management identifies any risk of point source pollutants to adjoining water bodies. The outcome of this whole farm assessment is categorized into four categories: 1) poor; 2) inadequate; 3) good and 4) excellent. Finally, the participating farmers and landowners receive two types of payments: 1) results-based payment and 2) supporting actions payment. The results-based payment is a summation of a habitat quality payment i.e., good quality peatland, grassland and woodland and maintenance of floodplain habitats adjacent to pearl mussel rivers, multiplied by whole farm assessment. The habitat quality for each farm is assessed based on a score between 1 and 10; with scores less than 3 receiving no payments / incentives, increased incentives from score 3 to 4 and much higher incentives from score 8 to 9. The supporting action payments are measures that can be availed by farmers and landowners for improving their habitat quality or whole farm score. The rate of this support is €50 per ha up to an annual maximum of €1,200. The supporting actions payments have to be approved by the PMP team.

5. Opportunities for Cooperative Sustainable Financing

The private finance sector has started to allocate resources specifically to sustainable financing. The volume of sustainable financing by private banks is estimated to exceed €200 billion.[47]

[46] https://www.pearlmusselproject.ie
[47] https://www.db.com/cr/en/docs/2020July_DB_Sustainable_Finance_Framework_final_for_disclosure.pdf

Institutional investors (e.g. Norwegian State Funds) and private banking are increasingly looking for investment opportunities that combine climate benefits with increases in biodiversity and social benefits. Peatland carbon stocks and peatland rewetting play an important role in accomplishing the upscaling of voluntary carbon markets. [48] Financial institutions can serve at various levels to match demand for Carbon Credits with supply relying on tangible projects that focus on resources for mitigation measures and access to land and markets. As an example, the UK based Royal Society for the Protection of Birds (RSPB) started a cooperation with Dutch Triodos Bank [49] to connect potential bank customers to peatland rewetting and conservation projects including additional funding from the bank to the peatland projects.

Financial institutions further hold the key to balancing risk assessments of peatland related investments. Investments and liabilities that are directly related to peatland drainage, peat cutting or burning of peat are highly carbon intensive economic activities. The analytical capacities of private and public creditor, banks, state owned investment funds, governmental entities providing loans or backing up loans, and family investment funds can be deployed to localize investment opportunities that combine both long-term climate benefits and lowering the risk of decapitalization from decarbonizing parts of the economy. [50] Future investments in a low carbon bio-economy sector and renewable energies should be sensible for potential long-term carbon emissions for projects on peatlands and the existing opportunities to compensate with Carbon Credits from peatland rewetting and restoration. [51]

For peatland rewetting, structural investments funds can be provided by both private and public financial partners. In Europe alone there are climate mitigation opportunities in peatlands of several billion euros annually given the large proportion of drainage-based land use in many EU countries. [52] To seize these opportunities, financial institutions need to engage in carbon crediting from peatlands on various levels of the transaction chain.

6. Economic land use analysis relating to peatlands

Based on the comprehensive figures provided by the EU Farm Accountancy Data Network, it is clear, that the increasing economic potential of carbon reduction in peatlands by rewetting and restoration will soon outstrip the economic value of many other land use types, especially if farm

[48] Institute for International Finance https://www.iif.com/Portals/1/Files/TSVCM_Report.pdf
[49] https://www.rspb.org.uk/get-involved/community-and-advice/green-living/green-living-at-home/ethical-banking
[50] McKinsey & Company (2020) How the European Union could achieve net-zero emissions at net-zero cost https://www.mckinsey.com/business-functions/sustainability/our-insights/how-the-european-union-could-achieve-net-zero-emissions-at-net-zero-cost#
[51] GMC position paper on renewable energy in peatlands https://greifswaldmoor.de/files/dokumente/Infopapiere_Briefings/200915_Kurzposition_PV%2BWindkraft-auf-Moor.pdf
[52] Tanneberger et al. 2021 The Power of Nature-Based Solutions: How Peatlands Can Help Us to Achieve Key EU Sustainability Objectives https://onlinelibrary.wiley.com/doi/10.1002/adsu.202000146

subsidies are provided for Carbon Farming projects (See table 3). However, combined with potential environmental and sociological benefits it appears that a very strong case can be made for restoration in areas where large amounts of GHGs are being emitted from damaged peatlands because a Carbon Credit can be issued for each tonne of CO_2eq emissions reduced from current levels per annum and subsequently for each tonne sequestered.

In this section we examine four of the main farming types that occur on peatlands and discuss the potential costs and benefits of each in relation to restoration. It should be noted that the relevant figures are based on all landscapes including organic and mineral soils. Peatlands generally only provide traditional farmland that is below average quality and requires drainage. The difference in farm income between farmland situated on drained peatlands and more conventional farmland based on mineral soils needs to be quantified for us to give a fully accurate picture. However, it is generally accepted by stakeholders that farming on drained peatlands is in most cases less financially lucrative than farming on mineral soils.

Table 3: Weighted Average farming incomes per ha (2019) compared with possible income from Carbon Farming (These figures are derived from tables 4-7 and table 2)

Description	Dairy Farming	Fieldcrops	Sheep and Goats	Cattle Farming	Carbon Farming
Direct Income per ha	€413	€120	-€70	-€170	€377
Subsidies per ha	€356	€308	€335	€377	€0
Total income per ha	€769	€428	€265	€207	€377

6.1 Dairy Farming

In the countries examined, average farm sizes for dairy farming range from 58.6 ha in the Netherlands where intensive farming methods are used, to 123.2 ha in the United Kingdom. The weighted average family annual farm incomes across all countries is around €67k. This is made up of around €35k in income from the milk produced and €32k in subsidies.

However, in France and Germany less than €10k comes from farm produce while around €35k is made up of subsidies. The Netherlands on the other hand has an annual average income of €90k from farm produce and €20k from subsidies. This is due to the intensive farming methods used. If we examine this by hectare, we see that the weighted average income for dairy farming is roughly €413 while weighted average subsidies are €356 for the entire project area balanced for the proportion of peatlands. This average income of €769 per hectare is most likely higher than the figure for dairy farming on peatlands as these are not considered to be the most productive lands across the farming soils in North-Western Europe and tend to have lower yields. This implies that there are not substantial economic advantages to pursuing such a business model, especially when considering the financial and environmental implications of applying for Carbon

Credits and the possibility of benefiting from other financial incentives when shifting toward more sustainable peatland management.

Table 4: Dairy Farms - Average Farm Size and Average Annual Income from the Farm Accountancy Data Network Survey (2019)

Dairy Farms – EU Farm Accountancy Data (2019) [53]								
Dairy Farms (Annual figures for 2019 Selected Countries)	Belgium	France	Germany	Ireland	Netherlands	United Kingdom	Average All soils	Weighted Average
Share of peat area for Weighting	0.4%	4.8%	21.3%	24.4%	4.5%	44.5%	n/a	n/a
Average Farm Size hectares (SE025)	61.7 ha	97.7 ha	80.1 ha	60.3 ha	58.6 ha	123.2 ha	80.3 ha	94.3 ha
Income per farm (SE131)	€281,009	€234,987	€281,287	€206,560	€426,917	€491,664	€320,404	€361,328
Expenditure per farm (SE270)	€228,131	€225,204	€272,955	€166,843	€336,339	€449,986	€279,910	€326,479
Income less Expenditure per farm	€52,878	€9,783	€8,332	€39,717	€90,578	€41,678	€40,494	€34,849
Subsidies per farm (SE405+SE600)	€22,123	€36,885	€34,938	€26,268	€19,704	€33,775	€28,949	€31,654
Family Farm Income per farm (SE420)	€75,001	€46,668	€43,270	€65,985	€110,282	€75,453	€69,443	€66,502
Income per ha	€4,554	€2,405	€3,512	€3,426	€7,285	€3,991	€4,195	€3,828
Expenditure per ha	€3,697	€2,305	€3,408	€2,767	€5,740	€3,652	€3,595	€3,415
Income less Expenditure per ha	€857	€100	€104	€659	€1,546	€338	€600	€413
Subsidies per ha	€359	€378	€436	€436	€336	€274	€370	€356
Family Farm Income per ha	€1,216	€478	€540	€1,095	€1,882	€612	€970	€769

6.2 Fieldcrop Farming

Fieldcrop farming in Europe provides a viable income for farmers, but it is dependent on subsidies. Average income less expenditure in the selected countries is just over €11k while average subsidies are roughly €41k. In Germany in particular, a huge subsidy masks a loss-making farming method. Given the potential environmental benefits, this would suggest that there is little or no case for fieldcrops on peatlands in Germany. The same applies to the UK and France.

A potential solution to this is paludiculture or wetland farming on rewetted peatland using alternative fieldcrops such as *Sphagnum*, *Typha* or *Reeds*, which could potentially provide economic benefits to farmers with reduced GHG emissions if a Maximum Sustainable Output (MSO) model is used. If income from other ecosystem services such as water retention or water purification could be added as part of the MSO, then these models become quite attractive for farmers.

[53] Farm Accountancy Data Network Survey (2019) https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html

Table 5: MINERAL soil Fieldcrop Farms - Average Farm Size and Average Annual Income from the Farm Accountancy Data Network Survey (2019)

Fieldcrop Farms – EU Farm Accountancy Data (2019) [53]								
Fieldcrop Farms (Annual figures for 2019, Selected Countries)	Belgium	France	Germany	Ireland	Netherlands	United Kingdom	Average All Soils	Weighted Average
Share of peat area for Weighting	0.4%	4.8%	21.3%	24.4%	4.5%	44.5%	n/a	n/a
Average Farm Size hectares (SE025)	60.4 ha	117.0 ha	126.5 ha	87.6 ha	57.5 ha	182.7 ha	105.3 ha	138.2 ha
Income per farm (SE131)	€152,413	€177,170	€225,973	€149,421	€307,474	€297,926	€218,396	€240,480
Expenditure per farm (SE270)	€125,992	€172,792	€229,971	€118,686	€282,570	€290,403	€203,402	€229,033
Income less Expenditure per farm	€26,421	€4,378	-€3,998	€30,735	€24,904	€7,523	€14,994	€11,447
Subsidies per farm (SE405+SE600)	€15,608	€29,148	€42,190	€31,368	€21,053	€49,339	€31,451	€41,048
Family Farm Income per farm (SE420)	€42,029	€33,526	€38,192	€62,103	€45,957	€56,862	€46,445	€52,495
Income per ha	€2,523	€1,514	€1,786	€1,706	€5,347	€1,631	€2,418	€1,849
Expenditure per ha	€2,086	€1,477	€1,818	€1,355	€4,914	€1,590	€2,207	€1,729
Income less Expenditure per ha	€437	€37	-€32	€351	€433	€41	€211	€120
Subsidies per ha	€258	€249	€334	€358	€366	€270	€306	€308
Family Farm Income per ha	€696	€287	€302	€709	€799	€311	€517	€428

6.3 Sheep and Goats and Cattle Farms

There is no obvious case for draining further peatlands to farm sheep and goats or non-dairy cattle. Tables 6 and 7 clearly show that these types of farming are no longer financially viable on any soils in the selected countries, without subsidies, except perhaps in the Netherlands.

Anecdotal evidence would suggest that these types of farming are even less viable on peatlands. It may however be possible in some cases to farm these animals on some types of rewetted or restored peatlands, depending on the peatland locations, site types and the selected breeds of animals.

The increasing value of greenhouse gas reductions would suggest that all peatlands of significant depth where sheep and goats or non-dairy cattle are farmed should be earmarked for restoration and rewetting from both an economic and an environmental standpoint. The farming of animals on these lands should be a secondary consideration.

Table 6: Sheep & Goats - Average Farm Size and Average Annual Income from the Farm Accountancy Data Network Survey (2019)

Sheep & Goats – EU Farm Accountancy Data (2019) [53]

Sheep & Goats (Annual figures for 2019 Selected Countries)	Belgium	France	Germany	Ireland	Netherlands	United Kingdom	Average All Soils	Weighted Average
Share of peat area for Weighting	0.4%	4.8%	21.3%	24.4%	4.5%	44.5%	n/a	n/a
Average Farm Size hectares (SE025)	0.0 ha	86.6 ha	77.1 ha	45.2 ha	31.3 ha	242.0 ha	96.4 ha	141.0 ha
Income per farm (SE131)	€0	€103,427	€108,184	€26,112	€261,092	€107,111	€121,185	€93,974
Expenditure per farm (SE270)	€0	€120,483	€118,524	€31,890	€232,700	€129,841	€126,688	€107,248
Income less Expenditure per farm	€0	-€17,056	-€10,340	-€5,778	€28,392	-€22,730	-€5,502	-€13,274
Subsidies per farm (SE405+SE600)	€0	€46,716	€39,226	€17,541	€9,953	€49,518	€32,591	€37,398
Family Farm Income per farm (SE420)	€0	€29,660	€28,886	€11,763	€38,345	€26,788	€27,088	€24,124
Income per ha	€0	€1,194	€1,403	€578	€8,342	€443	€2,392	€1,073
Expenditure per ha	€0	€1,391	€1,537	€706	€7,435	€537	€2,321	€1,143
Income less Expenditure per ha	€0	-€197	-€134	-€128	€907	-€94	€71	-€70
Subsidies per ha	€0	€539	€509	€388	€318	€205	€392	€335
Family Farm Income per ha	€0	€342	€375	€260	€1,225	€111	€463	€265

Table 7: Cattle Farms - Average Farm Size and Average Annual Income from the Farm Accountancy Data Network Survey (2019)

Cattle Farms – EU Farm Accountancy Data (2019) [53]

Cattle Farms (Annual figures for 2019 Selected Countries)	Belgium	France	Germany	Ireland	Netherlands	United Kingdom	Average All Soils	Weighted Average
Share of peat area for Weighted	0.4%	4.8%	21.3%	24.4%	4.5%	44.5%	n/a	n/a
Average Farm Size hectares (SE025)	62.2 ha	115.9 ha	66.8 ha	38.9 ha	22.5 ha	101.1 ha	67.9 ha	76.0 ha
Income per farm (SE131)	€147,124	€105,842	€114,231	€34,922	€173,387	€106,505	€113,669	€93,874
Expenditure per farm (SE270)	€144,202	€134,444	€131,561	€39,125	€169,633	€125,600	€124,094	€108,289
Income less Expenditure per farm	€2,922	-€28,602	-€17,330	-€4,203	€3,754	-€19,095	-€10,426	-€14,415
Subsidies per farm (SE405+SE600)	€29,415	€51,741	€29,228	€17,285	€8,334	€30,669	€27,779	€27,087
Family Farm Income per farm (SE420)	€32,337	€23,139	€11,898	€13,082	€12,088	€11,574	€17,353	€12,672
Income per ha	€2,365	€913	€1,710	€898	€7,706	€1,053	€2,441	€1,456
Expenditure per ha	€2,318	€1,160	€1,969	€1,006	€7,539	€1,242	€2,539	€1,626
Income less Expenditure per ha	€47	-€247	-€259	-€108	€167	-€189	-€98	-€170
Subsidies per ha	€473	€446	€438	€444	€370	€303	€412	€377
Family Farm Income per ha	€520	€200	€178	€336	€537	€114	€314	€207

6.4 Overview of drainage-based business opportunities

Current farm economics rely heavily on subsidies. Highly productive farms and intensive land-uses face the challenge of becoming trapped in a tightening investment cycle. This may prove economically unsustainable in the coming decade. Inflation and increasing energy / consumer prices could further deepen potential debt traps.

Economic consequences of peatland rewetting warrant spatial sensitivity. Regional differences in income per farming activity can be substantial. This is also true for investments in livestock farming facilities. Future investments in further intensifying drainage-based business should reflect on long-term costs of GHG emission increased by farming activities (e.g nitrous oxide emissions following nitrogen fertilization). Dairy farming on peat and the high investments needed to maintain dairy businesses might be most vulnerable to changes in market prices for carbon emissions connected to milk prices. Moreover, environmental regulation reducing nitrogen emission and reducing drought damage may limit business opportunities even on mineral soils. Alternative land-uses and business models are more likely to be implemented on peatlands. [54]

6.5 The potential for new socio-economic models

The MoorFutures® scheme in Germany has demonstrated that a gross income from Carbon Credits is possible at €935 per hectare per annum (See Table 1). A similar return was achieved in the Netherlands. While rewetting and monitoring costs varied between €184 and €932 per hectare per annum. [55] Based on the higher income and an average cost of €558 we can achieve a project income of €377 per hectare from Carbon Credits. This is comparable to real incomes from many types of conventional farming in the EU which are heavily dependent on subsidies. However, this is largely focussed on project costs and other farm costs may need to be factored in. Income from Carbon Credit schemes could be quite attractive for the highest value projects if costs are minimised (e.g., using the GEST method to verify emissions). Additional sources of income may include subsidies, tax breaks, income from ecosystem services and income from new types of farming on wet peatlands (i.e., paludiculture or the Maximum Sustainable Output model MSO). These potential income sources must take, into account the principle of additionality. However, it is clear, that blended economic models designed to maximise output for farmers on rewetted peatlands could provide the best overall outcomes taking, into account all social, environmental, and financial requirements.

[54] Tanneberger et al. https://doi.org/10.1002/adsu.202000146
[55] Gunther et al. https://doi.org/10.1016/j.ecolecon.2017.12.025

Besides the initial one-off cost of rewetting, there are further costs to maintain and improve rewetted peatlands and to monitor them in order to maximise GHG emission reduction and ecosystem service provisioning. All restoration costs can be spread over the duration of the project. A secondary income from additional ecosystem services is possible but has yet to be accurately quantified and perhaps a third income stream is possible by allowing paludiculture to take place on land used for the sale of Carbon Credits and other ecosystem services.

Our findings indicate that Carbon Credits are a potentially viable source of income for farmers and other landowners depending on price. It is also clear that financially and ecologically it makes more sense to initially target the peatlands with the greatest level of GHG emissions. Size also matters. Smaller sites can be rewetted, but such restoration projects clearly need to be subsidized in order to be financially viable.

The potential benefits of rewetting for an individual landowner are as follows:

- Secure and guaranteed income for the duration of the project, typically 30 to 50 years.
- Opportunity to contribute greatly towards societal change and to improve the natural environment and water system / hydrology.
- Opportunity to maintain active management and / or farming on the land (in the case of paludiculture or sustainable grazing management).
- Potential to reduce GHG emissions significantly.

7. Eco-Credits scheme: a new concept

The distinction between a subsidies-based system (i.e., PES and RBAPS), and a system based on a free market, such as the Carbon Credit market is that in the first case the services provided by rewetted land are paid by public authorities (e.g. regional water authorities in the Netherlands), relying on the political agenda of a specific time frame. In contrast, a Credit system can evolve independently.

Although the PES and RBAPS programmes can incentivise peatland restoration and sustainable management, none have led to the implementation of a sustainable market. A subsidy system and a Credit system may be adopted simultaneously although in such a case additionality may not be recognized by some of the already existing Credit systems.

However, additionality could be set aside for existing functioning peatlands that satisfy high standard baseline criteria, which actively sequester carbon. This would provide rewards for long-term existing good practice, while still ensuring atmospheric GHG is reduced. Alternatively, additionality criteria could be applied selectively, not including subsidies for other ecosystem services, if the incentives scheme is organized in such a way that not only GHG emission reduction, but also additional ES provisioning can be specifically accounted for and rewarded.

As previously mentioned, in the context of a voluntary market, the trading of Carbon Credits is related to a voluntary action to support and promote a project which reduces GHG emissions. The additional ES provided from peatlands have so far either not been considered or not been accounted for as added value to the Carbon Credit scheme despite some effort in this direction from the MoorFutures® initiative.

7.1 Blue Credit schemes

"Blue Credit" is a term used in the context of the NWE Interreg projects Carbon Connects and Care Peat to define tradable certificates for water related services provided by sustainable peatland management. The concept of Blue Credits [56] arises from the idea that functional peatlands and wet agriculture practices provide additional services to CO_2 emission reduction, i.e., water storage, water retention and water purification. In this regard it is interesting to consider one fundamental difference between Blue and Carbon Credits: Blue Credits and thus the benefits arising from water management, are typically contained more locally within a river catchment area than Carbon Credits. This makes it easier to identify who benefits from improvements and to devise payment mechanisms.

There are potentially two main ways identified for trading Blue Credits:

1. Incorporating them in a Carbon Credit system;
2. Creating a separate Blue Credit market;

In the first case, a conversion factor may be needed to translate water purification and water retention services into CO_2 emission equivalents (estimated value of water services divided by the number of Carbon Credits). Carbon Credits would be traded at a higher price if additional Blue Credits are included as part of an Eco-Credit (Carbon+Blue Credit) system. In both options mentioned, the monetary values of a given ES (and consequently of a Blue Credit) need to be estimated. What is traded then is a Blue Credit, which is equivalent to a certain amount of (ecosystem) service provided in a given context, project or activity. Many methodologies have been proposed for quantification of ecosystem services. One example applicable to peatlands is the **Deliberative Monetary Valuation protocol** developed by iCASP. [57]

Some areas may be mostly concerned with flood protection whereas other regions prioritise water purification. This could be considered an advantage for local restoration and rewetting

[56] The term Blue Credit is conceptually very different from established uses of the terms Blue Carbon (Credits), Blue Ecosystem services or Blue Natural Capital, where the term Blue refers to a marine nature of the carbon, ecosystem services or natural capital.
[57] https://icasp.org.uk/resources-and-publications/deliberative-monetary-valuation-protocol-resources

projects in Europe as developing countries cannot create a similar value. The methodology used to assess monetary value of ES and thus of Blue Credits goes beyond the scope of this paper and it is in our opinion a matter that should be addressed by the parties involved in the accounting and certification of the Blue Credit.

In the second case it is unlikely that a separate Blue Credit market could be created without a formal international framework for water equivalent to that established for Carbon Credits by the Intergovernmental Panel on Climate Change (IPCC). However, results and size-based payment schemes already exist and could be extended.

The MoorFutures® system has tried to integrate ES in a Carbon Credit standard. Next to the GEST approach to quantify GHG emissions reduction, MoorFutures® (version 2.0) employs five additional methodologies still under development (Table 8).

Table 8 Additional ES of MoorFutures® v. 2.0 and their quantification in a standard and a premium approach (Mod. from MoorFutures® https://www.bfn.de/fileadmin/BfN/service/Dokumente/skripten/Skript407.pdf)

ESS	Standard	Premium
Improved water quality	Estimation using the NEST approach (kg N y^{-1})	Modelling with WETTRABS (kg N a^{-1}) and Prisiko (kg P y^{-1})
Flood prevention	Modelling of the retention volume (m^3) - as a standard procedure if entry data available, or else as a premium procedure. Modelling of flood peak reduction as a premium procedure only	
Groundwater enrichment	Modelling for the total available amount of water (m^3) and the water table (cm above/below surface) - as a standard procedure if entry data are available. Or else as a premium procedure	
Evaporative cooling	Estimation using the EEST approach (W m^{-2} or kWh ha^{-1} y^{-1})	Modelling with AKWA-M (W m^2 or kWh ha^{-1} y^{-1})
Increased mire typical biodiversity	Estimation using the BEST approach	Measuring and evaluation through indicator species model

Two approaches have been applied and (partially) tested in the MoorFutures® system: (1) the *standard* approach is an estimation procedure which requires less time and less data. It is less accurate (and cheaper) but still provides a (conservative) quantitative estimate of the ESS. (2) the *premium* approach requires more time and data; it is more expensive but also produces more accurate results.

It should be noted that in the MoorFutures® system, the ES are both explicitly targeted and (semi) quantitatively expressed, **although only GHG emission reductions are commodified**. Therefore, the question on how to frame a successful scheme to account for Blue Credits remains open. As in the case of a Carbon Credit, the first step is to define the Blue Credit **as a financial unit** which can be traded.

7.2 Towards an (integrated) Eco-Credit system for Europe

High quality standard verification systems are usually quite expensive to achieve for small private entities. The example of MoorFutures® showed that quality can be guaranteed and costs lowered if the accreditation is carried out to a regional standard. In the case of MoorFutures® transaction costs are greatly reduced compared with VCS and Kyoto Protocol projects, because validation and certification are carried out 'in-house' by the University of Greifswald. This approach is not uncommon on the voluntary market but does require that emissions reduction is estimated conservatively and with the greatest possible transparency.

In addition to this, national frameworks have now been developed in the Netherlands (Green Deal National Carbon Market) and the United Kingdom (Peatland Code). The latter uses a similar proxy measurement expert assessment to Moorfutures®. The former uses a uniquely Dutch model, which relies on water levels coupled with expert opinions to measure greenhouse gas emissions. When calculating the total CO_2eq for Carbon Credits, both scenarios (reduction and sequestration) can be included in the calculation either as a unique absolute value or as a separate one, accounting for both carbon uptake and carbon reduction. Other ecosystem services can potentially add value to Carbon Credits by including Blue Credits (credits relating to water).

In the context of wet agriculture (paludiculture) an easy and cheap accreditation system based on proxies to assess GHG emission reduction such as the GEST system used by MoorFutures® seems to be the most suitable as it reduces costs by minimising the need for expensive equipment on multiple sites. Moreover, the quality and reliability of the Eco-Credits issued need to be guaranteed. Following the example of MoorFutures®, an option would be to set-up accreditation systems at regional or national level, which could be scaled up throughout Europe with public authorities or Governments at various levels acting as quality guarantors of each accreditation system.

The European Commission anticipates that emissions by the land use, land-use change, and forestry (LULUCF) sector will be fully integrated into the 2030 EU GHG target as reported under the UNFCCC inventory. The EC is looking to develop a certification system for carbon removal to encourage landowners to store more CO_2 on their land. While the EC is aware of the possibilities for the LULUCF GHG inventory sector to become the first sector to achieve net zero emissions, common guidelines on how to measure and account for Carbon Credits and Blue Credits (Eco-Credits) are urgently needed.

7.3 Eco-Credit Use Case

The Use Case in Figure 4 below outlines the recommended attributes of an Eco-Credit system for peatlands. In the first instance, a framework at national or regional level is desirable. This can provide a legislative, administrative and policy context for Eco-Credit schemes. A database of peatland types, map-based data and associated emissions is necessary to allow the implementation of standardized GHG emissions assessment models (like GEST). Details of a project site need to be established and monitored to ensure that the sale price of Eco-Credits can fund the financial requirements of the project i.e., securing restoration funding and landowner reward payments. GHG emissions are evaluated for the duration of the project on a conservative basis and converted into individual Carbon Credits representing 1tCO_2eq each and sold via the Voluntary Carbon Market as regular Carbon Credit certificates, with the option of adding a Blue Credit portion to create a higher value for each Eco-Credit certificate.

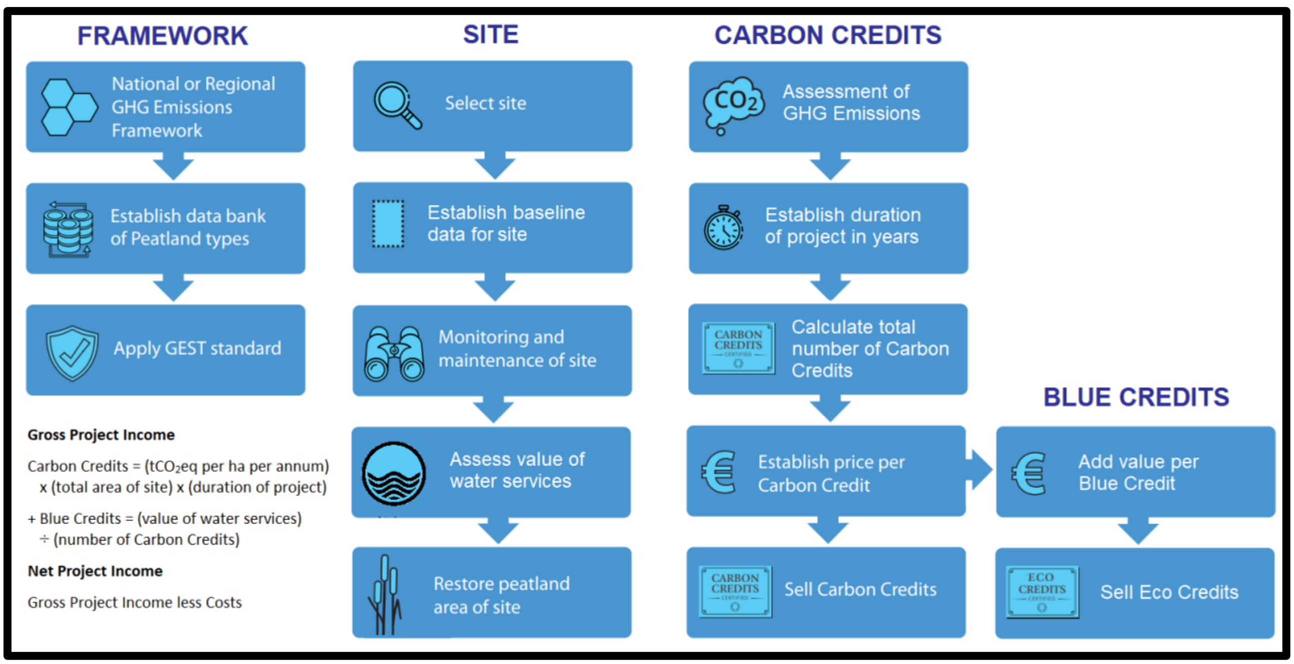

Figure 4 – Use case describing the necessary components of peatland restoration projects involving the sale of Eco-Credits.

8. Conclusions

Peatlands can play a key role in reducing greenhouse gas emissions. Financial measures are needed to incentivise peatland rewetting and restoration and to reward those who already maintain peatlands in good condition.

Carbon Credit systems on their own do not effectively support sustainable peatland management practices and restoration. Some key issues of concern are as follows:

- Sale on international markets requires certification to international standards (VCS) which are too expensive for most small peatland areas and the sale of land use projects based in developed nations is specifically excluded from the ETS.
- Different socio-economic and environmental conditions characterising peatland areas in EU countries require criteria to fit the regional situation including ownership of peatlands.
- The credibility of Credits issued needs to be guaranteed by Governmental regulatory systems or to be accredited to an accepted industry standard.
- The current Carbon Credit price is still too low to be attractive without additional subsidies.

There needs to be a major coordinated effort at all levels of governance to quantify the carbon metrics and other PES / RBAPS metrics in order to allow easy access to markets.

Some examples of successful Credit systems for peatlands can be found in Europe. However, to reach global climate and biodiversity goals there is a need to extend those to a much larger area than is currently the case. Common guidelines on how to measure and account for Eco (Carbon and Blue) – Credits at EU level are urgently needed to enable Eco-Credits obtained from peatland restoration projects to reach investors and the international markets.

The costs associated with rewetting and restoring peatlands need to be reflected in the price of associated Eco-Credits.

A shift in the allocation of agricultural subsidies is needed so that agricultural practices on peat soils can be subsidized only if wet-agriculture practices are implemented.

Eco-Credits that account for both GHG emissions reduction and additional ecosystem services may provide more incentive for stakeholders to support peatland restoration than stand-alone Carbon Credits.

Provision of subsidies for peatland restoration and maintenance is required to avoid the "**paradox of additionality**" and thus ensure that potential ecological benefits are not priced out of the market by unsustainable practices.