A GUIDE TO CARBON MARKETS

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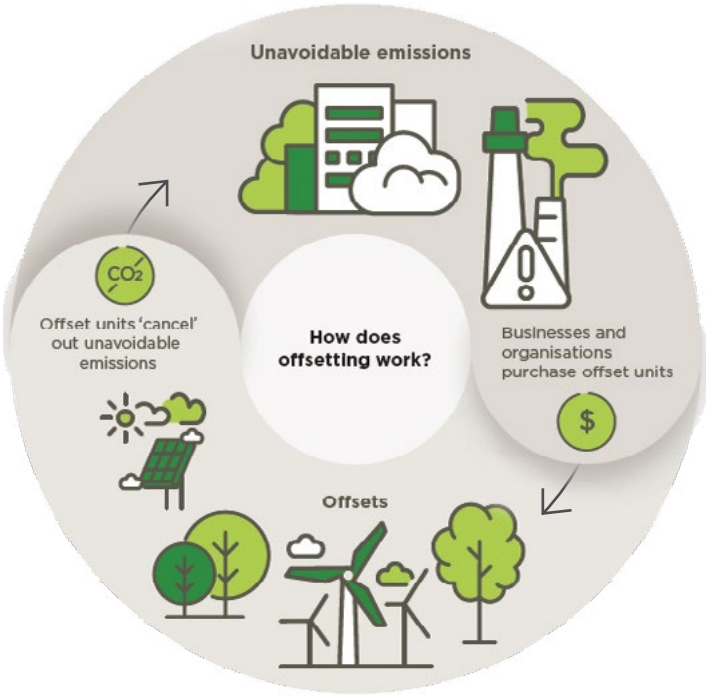
INTRODUCTION

In line with the objectives set out in the 2005 Kyoto Protocol and the 2015 Paris Agreement, governments have made pledges to reach net zero targets in upcoming decades.

The UK has committed to achieve Net Zero by 2050. To achieve this, they are allowing companies to offset their unavoidable carbon emissions, by creating a financial incentive for the biggest emitters to cut back, therefore creating a demand for "carbon credits" (1 carbon credit = 1 tonne of sequestered CO2e – meaning carbon which is captured and stored).

Regulated carbon trading actively started in 2005 when the EU set up the first international Emissions Trading Scheme (EU ETS). Since 2021, the UK government have set up their own ETS (UK ETS) as continuation of the EU ETS in a post-Brexit environment.

Alongside the regulated carbon markets have emerged unregulated ones (voluntary markets).



How carbon offsetting works -
(illustration adapted from Grain Growers Limited, 2021)

CARBON CREDITS MARKETS

Compliance markets for energy-intensive industries, the power generation sector and aviation

The compliance market is a regulated market, used by companies and governments that, by law, are required to account for their greenhouse gas emissions. Under the compliance markets, carbon credits are recorded in a registry and "retired" once they have been used to offset emissions. The main three compliance carbon markets are:

1. Kyoto Protocol 2005 - United Nations Clean Development Mechanism (UN CDM)
   - Permits countries with commitments under the Kyoto Protocol to implement emission-reduction projects in developing countries, to be invested in by public or private sectors from developed countries.
   - Projects under the CDM can earn saleable certified emission reduction credits (CER), each equivalent to one tonne of CO2, which can be counted towards meeting Kyoto targets[1].
2. EU Emissions Trading Scheme (EU ETS) – cap and trade system
   - Began operating in 2005, making it the first international emissions trading system.
   - The EU ETS has set a cap on the maximum amount of greenhouse gases that companies can emit annually. Allowances (which is the currency of the carbon market) are issued each year to companies to cover their emissions. If a company does not have enough allowances to cover its emissions, it can either cut them back or buy additional allowances from another emitter . Over time, fewer allowances are issued, therefore pressuring emissions to be reduced.
   - From 2005 to 2019, there was a 35% reduction in emissions for companies under the EU ETS framework.

[1] United Nations Climate Change **https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism**

[2] European Commission, **https://ec.europa.eu/clima/policies/ets_en**

3. UK Emissions Trading Scheme (UK ETS) – cap and trade system

- The UK ETS replaced the EU ETS on 1st January 2021 after Brexit.
- As the UK was a major contributor to the design of the EU ETS, many principles and processes remain similar. At the moment, allowances are not intertradable between the two markets.
- The UK ETS has set higher ambitions with tighter emissions caps than the EU ETS. Any activity covered in the UK ETS must have a greenhouse gas emissions permit. Some activities require additional permits/plans. Once a permit has been issued, the permit holder may be allocated free emissions allowances. If obligations under the permits are not complied with, the permit holder runs the risk of significant civil penalties.
- As with the EU ETS, allowances are introduced in the market through auctioning.

Voluntary markets – "non-traded" (non ETS credits)

Voluntary carbon markets have emerged parallel to the regulated ones, for the private sector and individuals that want to offset their greenhouse gases emissions. Credits under the voluntary market cannot be used for compliance purposes. The main standards for voluntary carbon trading in the UK are:

- The Woodland Carbon Code (WCC) – operational.
- The Peatland Carbon Code (PCC) – operational.
- The Soil Carbon Code (SCC) – currently being developed.

Actors in those markets, called 'purely voluntary buyers', can be:

- Private companies and entities that purchase pre-compliance offsets before emissions reductions are required by regulation, for corporate social responsibility and/or marketing purposes.
- Individuals that take it as their responsibility to offset their own emissions.

TYPES OF CREDITS THAT CAN BE SOLD

Credits under the Woodland Carbon Code

The Woodland Carbon Code was produced by the Forestry Commission and launched in 2011, supported by the UK government. It sets out robust requirements for voluntary carbon sequestration projects.

Under the Code, it is only possible to generate Woodland Carbon Units on new planting projects and all projects must be registered with the UK Land Carbon Registry before planting. Currently, carbon sequestered by existing environmental assets cannot be sold. For instance, a farmer cannot sell the carbon from an existing 80 year old woodland.

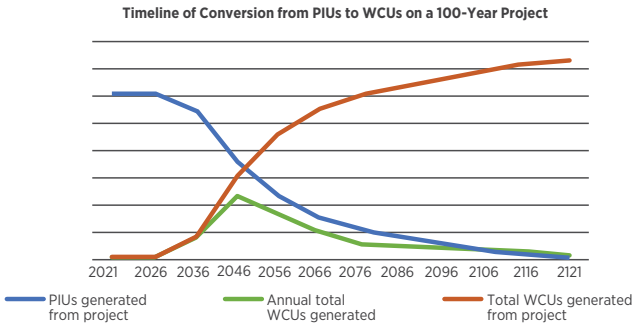
Farmers and landowners can only register a planting project if it would not have gone ahead without the extra income from selling the Carbon Units.

Under the Woodland Carbon Code, Woodland Carbon Units can either be sold as:

- Pending Issuance Units (PIUs) – this is known as the 'upfront payment market' and is a promise to deliver under the WCC. The quantity of CO2e that will be sequestered is calculated over a period of time and the buyer pays upfront. Selling carbon upfront can be a good option for farmers and landowners as the price is already known and in some cases the burden of validating and verifying processes (and the associated costs) are dealt with by the buyer/broker. By buying PIUs, buyers are not directly offsetting their carbons emissions but are able to say that they are on the path to carbon neutrality.
- Woodland Carbon Units (WCUs) – this is known as the "through time payment market". These are credits for carbon that the woodland has already sequestered – usually over the previous five years. PIUs are converted to WCUs overtime through verification[3].

The below chart illustrates the conversion of PIUs to WCUs on a 100-year project (first 100 years). The blue line shows the total PIUs generated from the project, the green line shows the annual total WCUs generated from the project and the red line shows the cumulative WCUs generated from the project. WCUs are verified PIUs. Once the woodland has reached its carbon sink period (year 5 to year 100), WCUs can be generated.

Moreover, most tree species are at the peak of their carbon sequestering capability when they are between 16 and 25 years old, hence the sharp rise between 2036 and 2046 followed by a subsequent decrease in WCUs generated thereafter (see below).



[3] Woodland Carbon Code, **https://woodlandcarboncode.org.uk/images/PDFs/Woodland_Carbon_Code_V2.1_March_2021.pdf**

[4] Peatland Code, **https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-07/PeatlandCode_v1.1_FINAL_0.pdf**

Credits under the Peatland Code

Peatlands are carbon-rich wetlands which occupy 3% (circa 4 million km^2) of the global land surface and 12% of UK land area[5]. Worldwide, they store more than twice as much carbon as all existing forests.

When peatlands are in their natural water-logged state, they capture CO2 from the atmosphere through photosynthesis and their plant material only decomposes partly, meaning that it does not release CO2 back into the atmosphere.

In the UK, it is estimated that peatlands alone store circa 3.2 billion tonnes of carbon. However, due to past and present management of peatlands, they are at present sources of carbon emissions[5] (currently contributing to circa 4% of UK's total annual greenhouse gas emissions).

Restoring peatlands can reduce or stop their own greenhouse gas emissions whilst sequestering additional carbon in the long term, improving soil health and reducing flood risk in some catchments. Peatland restoration can be done through rewetting by blocking drains to restore the water table, and re-establishing peatland where possible from former agricultural/afforested areas or mineral workings, etc.

The Peatland Code works much like the Woodland Carbon Code, generating PIUs and Peatland Carbon Units (PCUs). Once projects are registered with the UK Land Carbon Registry, they go through a validation process to be able to issue PIUs and, after verification a few years later, PCUs can be issued.

PEATLAND CODE

Credits under the Soil Carbon Code

Soil carbon sequestration is a complex subject, as it is difficult to calculate how much carbon is stored in the soil and how long it is stored for as it varies widely depending on a range of factors.

In July 2021, the Environment Agency awarded a grant to a consortium of farmers, academics, technology businesses and NGOs, including the Sustainable Soils Alliance, led by FWAG to develop and pilot the UK Farm Soil Carbon Code[6].

In the UK, there is currently one operational scheme and various in development, for generating carbon credits from regenerative agriculture practices. Other schemes are operational in Europe.

Drainage channel in peatland which will lead to drying of the peat and previously stored carbon being emitted

The Peatland Code Process
(Picture from **https://tinyurl.com/w58tv2dt**)

[5] UK Centre for Ecology & Hydrology, **https://www.ceh.ac.uk/sites/default/files/Peatland%20factsheet.pdf**

[6] Sustainable Soils Alliance, **https://www.sustainablesoils.org/images/pdf/NEIRF_Grant_Win_PR_July_21_FINAL_1.pdf**

CALCULATING LAND-BASED CARBON

Carbon sequestered by trees

Trees do not sequester carbon at a steady rate. There are three carbon sequestration cycles in the life of a tree:

- Carbon source period = 0 – 5 years – tree releases more carbon than it sequesters.
- Carbon sink period = 5 to 100 years – tree sequesters more carbon than it releases (with 16 - 25 years being the peak of carbon sequestering capability for many tree species).
- Carbon store period = Year 100 onwards – amount of carbon released equals that sequestered.

To calculate predicted carbon sequestration from a project registered under the WCC, the **WCC Carbon Calculation spreadsheet**[9] can be used. The results are checked at validation and re-assessed at the verification stage. Further guidance on carbon calculation from woodland projects is available on the **Woodland Carbon Code** website.

Reduction of carbon emissions from peatlands

To calculate predicted carbon emissions reductions, the **Carbon Emissions Calculator**[10] is used, which is part of the Peatland Code documentation available on their website.

Soil carbon sequestration

At the moment, there is no soil carbon code due to the complexity of the variation of soil carbon sequestration rates, and therefore there is no UK template on how best to measure it. However, different soil carbon dynamics models exist such as Henin-Dupuis, RothC, Century and AMG. Any of these models can be used to assess soil carbon sequestration but long-term estimations are difficult.

HOW MUCH CARBON MIGHT A LANDOWNER HAVE TO SELL?

The carbon calculation spreadsheets for both the WCC and PC should be used to estimate how much carbon a landowner might have to sell.

However, before selling the carbon, we recommend that a landowner understands the carbon footprint of their own business. If they have sold all the carbon their land can sequester to third parties, they will find themselves in a position where they cannot easily offset their own emissions. Think ahead - carbon offsets may well be a requirement for land-based businesses soon.

An example under the Woodland Carbon Code

If 10 hectares of arable land was converted to native woodland under the WCC, the sequestration over 100 years would be circa 7,900 tCO2e, of which 6,320 tCO2e can be sold (as 20% or 1,580 tCO2e would go to the WCC Buffer).

[9] Woodland Carbon Code, **https://woodlandcarboncode.org.uk/images/Spreadsheets/WCC_CarbonCalculationSpreadsheet_Version2.4_March2021.xlsx**

[10] Peatland Code **https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/PC_Emissions_Calculator_v1.2_protected%20cells.xlsx**

[11] Gov UK, 2021, **https://www.gov.uk/guidance/woodland-carbon-guarantee**

WHAT DOES THIS MEAN IN PRACTICE FOR LANDOWNERS?

How do I find someone to buy my carbon?

- In England, you can sell carbon units to the government through DEFRA's Woodland Carbon Guarantee (WCaG) auction. Projects must be registered under the WCC. Successful sellers are offered agreements at a guaranteed index-linked price for 35 years. This gives the seller the option to sell their units to the government at the guaranteed price - but they don't have to if they don't want to. It therefore gives them greater certainty. Payments would be made every five or ten years when verification has happened. Auctions take place every six months approximately.
- Register projects on the UK Land Carbon Registry (for WCC and PC) or any other verified programs and be on a public register available to all potential buyers.
- Use carbon brokers or find a private buyer.

Selling Basis

Landowners can get paid upfront for afforestation or peatland rejuvenation projects before the carbon has been sequestered or emissions reduced.

Once registered under a code, the landowner can start selling PIUs for future planned offsetting ('on track to offset emissions'). Every 5/10 years, these units are verified and if validated, they can be converted to WCUs or PCUs. These get sold for current offsetting purposes.

There are circa 12,000 large companies in the UK who are required to undertake greenhouse gas monitoring. The UK Carbon Codes offer them an opportunity to buy carbon credits to compensate current emissions or participate to achieve their long-term carbon neutrality plan[12].

Steps to sell your carbon credits

Promote your scheme

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Find a buyer (see section above)

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Negotiate the right agreement for your objectives (e.g. on price, when payments are made, access rights, options on further schemes)

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Agree the programme for when and how the Carbon Units will be paid for and ownership transferred

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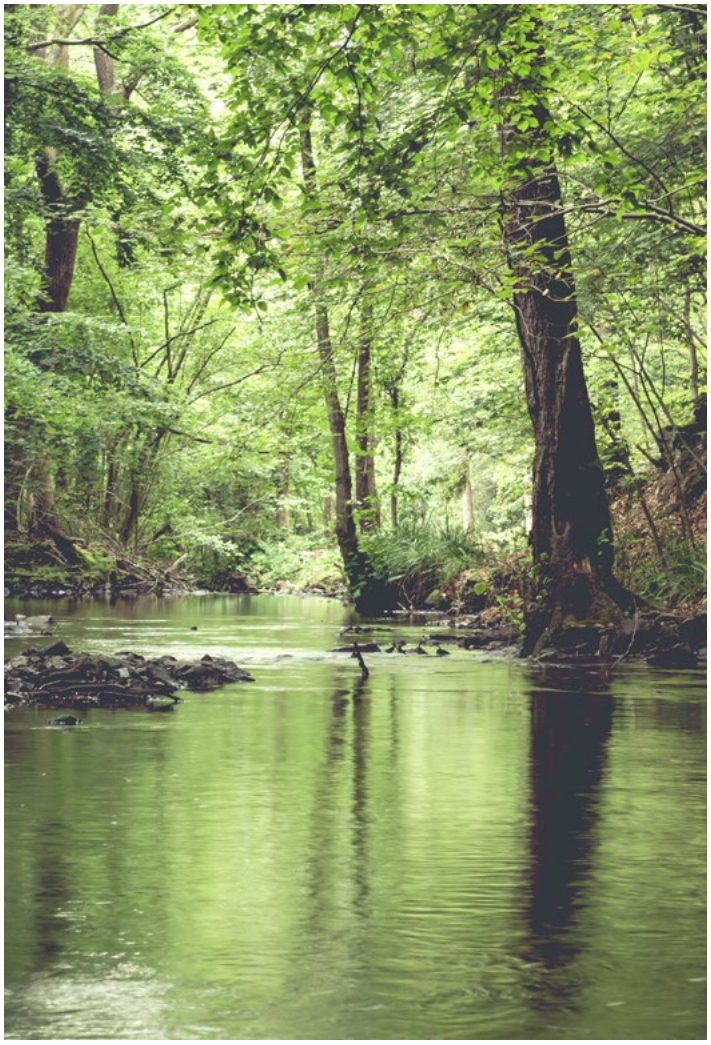
Transfer Carbon Units ownership and receive payment



CURRENT AND EXPECTED FUTURE VALUES OF CARBON

Within the UK, companies are paying between £7 and £20 /tCO2e for purchases of PIUs[13] (with the price offered varying according to location and scheme types).

Vintage PIUs (PIUs between verification stages in order to be converted to WCUs) are selling at a premium of circa £30 per PIU[14].

It is expected that prices will increase as pressures to achieve net zero targets will increase demand in the coming years. A report from LSE and Grantham Research Institute suggested that, to meet net-zero targets, shadow carbon prices would increase to circa £75/tCO2 in 2030 and to circa £160/tCO2 in 2050[15].

[12] Carbon Store, 2021, **https://carbonstoreuk.com/publications/the-users-guide-to-the-woodland-carbon-market/**

[13] Woodland Carbon Code **https://woodlandcarboncode.org.uk/landowners-apply/how-do-i-sell-my-carbon-units**

[14] Carbon Store UK, 2021, **https://carbonstoreuk.com/publications/woodland-carbon-update-july-2021/**

[15] LSE and Grantham Research Institute **https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2019/05/GRI-POLICY-BRIEF_How-to-price-carbon-to-reach-net-zero-emissions-in-the-UK.pdf**

WHAT TO CONSIDER BEFORE SELLING CARBON

1. **Ensure that the verification scheme is of high quality** - as there are a small number of acknowledged international standards for verification, it is essential that buyers can rely on a trusted and rigorous process. Good quality offsets must be associated with greenhouse gas reductions that are additional, not overestimated, permanent, claimed by only one entity and not associated with any environmental or social harms[16] [17].
2. **Understand the implications that lie within carbon trading** – these include considering the consequences for farming economics, interactions with other environmental schemes, effect on the capital value of land and property, tax issues, land tenure issues and the consequences of the land use change to woodland.
3. **Be aware and keep track of your available carbon credits to sell to avoid double-counting** – once a landowner has sold sequestered carbon, this appears on the buyer's balance sheet. Landowners should understand how much carbon their land can sequester, how much they are producing on the land and any surplus that can be sold to third parties without detrimentally affecting their position from a financial, environmental and reputation point of view.

   It is inevitable that supermarkets and food processors will want their own supply chains to be low carbon and if a farmer has sold all of their carbon credits to another emitter for offsetting purposes, they will not be able to use the 'sold sequestration' against their own emissions. Be also mindful of double counting in a landlord / tenant scenario.
4. **Have a contingency plan in place to avoid breaking your contract** – contracts between buyers and sellers of carbon are usually agreements over a long period of time i.e. 30 years. Be aware that if, for instance, a woodland suffers from a fire, the seller would have to still provide the same amount of carbon sequestration as per the terms of the contract. This could mean replanting woodland or supplying it from another source. The WCC has set up a centralised buffer account to which all sellers have to contribute 20% of each project's carbon credits. This is used as insurance if ever trees in a verified scheme are damaged[13]. Our understanding is that if a landowner sells land used to generate and sell carbon credits, the obligations in the contract transfer to the buyer.
5. **Avoid greenwashing by knowing your buyer** – greenwashing can happen when buyers offset their carbon but have not first taken steps to offset their avoidable emissions of greenhouse gases and therefore are still major pollution contributors. To avoid getting involved with such buyers, transparency and knowing the buyer is key. If the buyer is greenwashing or intending to, this could damage the seller's reputation.

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[16] Farm Carbon Toolkit, 2021, **https://farmcarbontoolkit.org.uk/2021/08/12/demystifying-farm-carbon-offsetting/**

[17] Carbon Offset Guide, **https://www.offsetguide.org/avoiding-low-quality-offsets/**